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SUMMARY REPORT OF THE INVESTIGATION OF TRICHLOROETHENE IN GROUND WATER AND PROPOSED GROUND-WATER REMEDIAL SYSTEM

LENOX CHINA FACILITY AND ADJACENT AREA POMONA, NEW JERSEY

VOLUME I

Prepared for

Lenox China
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Geraghty & Miller, Inc.
Environmental Services
290 Vincent Avenue
Hackensack, New Jersey 07601

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EXECUTIVE SUMMARY

During routine sampling in July 1986, trichloroethene (TCE) was discovered in ground water at the Lenox China Pomona facility. From September 1987 to February 1990, two plumes of ground water containing TCE were delineated in areas of Lenox property and onto adjacent properties. These plumes emanate from the areas of two TCE handling facilities at Lenox: the Drum Storage Pad and the Degreaser Sump.

The delineation was accomplished by means of temporary well points and a portable gas chromatograph (GC), which provided for real-time water-quality information that guided the investigation. Certified laboratory backup of the field GC information was included as part of the program. Monitoring wells were installed to verify the results of the well point investigation and to collect hydrogeologic data. An aquifer pumping test was performed to determine aquifer characteristics.

Soil samples were collected from around the Drum Storage Pad and the Degreaser Sump to determine whether a source of TCE remained in the soils that would require remediation.

Based on the aquifer characteristics, Geraghty & Miller, Inc. designed a ground-water remedial system that includes four recovery wells pumping approximately 400 gallons per minute and reinjection of the treated water using a network of four injection wells. The design for the treatment and piping system is described in a separate report that will be submitted by Eder Associates.

INTRODUCTION

Geraghty & Miller has prepared the following report at the request of Lenox China to summarize the results of the investigation of trichloroethene (TCE) in ground water at the Lenox China facility in Pomona, New Jersey and to describe a proposed ground-water remedial system. The New Jersey Department of Environmental Protection (NJDEP) has been sent all data that have been collected for this project in the form of two data reports (Geraghty & Miller, 1987; Geraghty & Miller, 1988) and 12 progress reports prepared by Geraghty & Miller during periods of active fieldwork.

SITE BACKGROUND

The investigation described in this report was performed on the Lenox China property in Pomona, New Jersey and on adjacent properties. The location of the facility is shown on Figure 1. TCE was first discovered in ground water at the facility in July 1986, with the initial sampling of Monitoring Well 10, which was installed as a requirement of the plant's New Jersey Pollutant Discharge Elimination System (NJPDES) permit to monitor the potential impact of a lead-bearing waste pile. A facility map is included as Figure 2.

Fine china dinnerware and giftware have been manufactured at the facility since operations began in 1953. The decorating process uses a TCE vapor degreaser to strip acid-resistant wax from etched chinaware. The semi-solid TCE degreaser sludge is accumulated in 30-gallon drums at the Degreaser Sump and the drums are then stored temporarily at the Drum Storage Area until they are removed from the site. The locations of these two TCE-handling facilities are shown on Figure 2.

The surrounding area is zoned as rural industrial and has not been developed. The topography is flat with an average elevation of approximately 65 ft above mean sea level. Vegetation consists principally of scrub pine and low underbrush. The nearest surface water is Jack Pudding Branch of Babcock Creek, which flows in an area upgradient of the TCE ground-water plumes.

The site is underlain by the Cohansey Sand, an unconsolidated sand and gravel aquifer with varying amounts of silt and clay. Discontinuous clay layers occur within the aquifer, and an impermeable unit, at a depth of approximately 250 ft, marks the lower boundary of the Kirkwood-Cohansey aquifer system (Zapecza, 1984). Ground water flows generally from west to east.

REPORT ORGANIZATION

This report describes and presents the results of several phases of field work that were carried out to collect data necessary for developing a ground-water remedial system. The report is organized into and presented in the following sections: Investigation Methodology, Physical Results of Investigation, Chemical Results of Investigation, Recommended Ground-Water Remedial System, and Recommended Ground-Water Monitoring Program. Appendix A contains hydrogeologic and well construction data, Appendix B describes an aquifer test that was performed during the investigation, Appendix C presents a mounding analysis for disposal of recovered ground water,
Appendix D (presented as Volume II) includes the laboratory data packages for groundwater samples, and Appendix E (presented as Volume III) includes the laboratory data packages for soil samples.

INVESTIGATION METHODOLOGY

Delineation of the plume of TCE began in September 1987 and was completed in February 1990. Field investigatory work has consisted of determining the extent of TCE in ground water, collecting hydrogeologic data necessary to design a ground-water remedial system and collecting shallow soil samples from around the Drum Storage Pad and the Degreaser Sump.

Field Analysis of Ground-Water Samples Collected from Well Points

The areal and vertical extents of the TCE dissolved in ground water were determined using a field sampling and analytical procedure in which the real-time field results guided the investigation. A 1-1/4 inch diameter well point with a 2 or 3-ft long stainless-steel screen and steel casing was hammered into the ground. At any desired depth, a ground-water sample was collected from the well point and analyzed in the field for volatile organic compounds (VOCs), specifically TCE, using a portable gas chromatograph (GC). The portable GC can detect TCE at concentrations as low as 10 micrograms per liter (ug/L) [parts per billion (ppb)]. To confirm the portable GC results, approximately 30 percent of the samples collected were analyzed for halogenated VOCs using Method 601 by a New Jersey-certified laboratory, either Analytikem Laboratory in Cherry Hill, New Jersey or Erco Laboratory in Cambridge, Massachusetts.

A Geraghty & Miller hydrogeologist directed the field investigation. The following guidelines were used to decide the total depth of the well point, the interval between sampling depths, and well point locations:

> Samples should be collected from zones having at least a moderate water-bearing capacity.
>
> Samples should be collected from the depths that would be expected to show contamination, as revealed by existing water-quality and hydrogeologic data.
>
> The spacing between well points should be great enough to identify changes in concentrations, but close enough to determine plume dimensions.

The well points were installed in several phases because of delays in obtaining easements for performing the investigation on adjacent private properties. A total of 70 well points, designated B1 through B17 and B19 through B71, were installed by this method; the locations are shown on Figure 3. The portable GC was not operating properly when B18 was installed, and no samples were available from that well point for laboratory analysis.

Absecon Electric Motor Works, a licensed New Jersey driller, installed all of the well points. Except where samples were to be collected near land surface, a preliminary borehole was drilled using solid-stem augers to a depth approximately 5 ft above the first zone to be sampled. The augers were removed and the well point was driven into the ground using a 140-lb hammer. Prior to installing each well point, the screen, casing, and augers were steam cleaned. A centrifugal pump with new polyethylene tubing was used to evacuate approximately three well-point volumes of water. Samples were then collected using a Teflon™ bailer that had been decontaminated prior to use with a detergent wash and a deionized water rinse and was attached to new polyethylene cord. Additional depths were sampled by hammering the well point further. With the exception of 19 well points, at the completion of sample collection the well point was immediately removed and the borehole was filled to ground surface with bentonite slurry in accordance with NJDEP protocols. Thirteen of the 19 well points that were left in the ground were surveyed by Fellows Read & Associates, Inc., a licensed New Jersey surveyor, to provide water-level elevation measuring points. Six other well points (B66 through B71) remain in the ground and have not been surveyed. All 19 of the well points that remain in the ground are equipped with locking protective steel casings.

For each ground-water sample collected from a well point, at least two 40 mL VOC vials were filled; one was used for the field analysis and the other was saved for possible laboratory analysis. An ice-filled cooler was used to store and ship samples. All samples were shipped to the laboratory by overnight delivery service with chain-of-custody documentation.

A Photovac 10S50 portable GC was used to determine the presence or absence of VOCs in the aqueous samples collected from the temporary well points. The GC was calibrated for aqueous headspace analyses by injecting the headspace vapors of a previously prepared standard. The standards used for the investigations performed during 1987 contained DCE and TCE. It was determined that TCE was the predominant compound, so the standards used for the investigations performed during 1989 and 1990 contained only TCE. An average response factor was calculated for each compound by dividing the

concentration of the standard by the average peak area obtained from five standard injections. The samples were analyzed by taking one of the 40 mL glass vials, discarding half of the sample, and then warming the water in the half-filled vial to the approximate temperature of the standards. The sample was then shaken vigorously for 60 seconds and a headspace sample was taken with a gas-tight syringe and injected into the portable GC. Duplicate analyses and laboratory analyses were performed to ensure the precision and accuracy of the portable GC.

Installation of Monitoring Wells

During June, September, and October 1988, 12 monitoring wells were installed to verify the results of the well point investigation and to provide water-level measuring points. Guided by the results of the well-point investigation, the 12 wells were located at areas within the plume and also around the periphery of the plume; the screens were set at the depths most likely to contain TCE. The wells are designated 11, 12S, 12D, 13, 14S, 14D, 15, 16, 17, 23, 24, and 25, and their locations are shown on Figure 4. Two 2-well clusters (12 and 14) were installed to collect vertical hydraulic head data and to evaluate the water quality at greater depths in the aquifer. The S suffix designates the shallower well and the D suffix designates the deeper well. Geologic data were obtained by collecting split-spoon samples at 5-ft intervals during the drilling of Wells 11, 12D, 13, 14D, and 15. Lithologic logs based on these samples are included in Appendix A.

The wells were drilled and installed by Absecon Electric Motor Works using the mud rotary method. The drilled borehole was 6 inches in diameter and the wells are 2 inches in diameter with 10-ft long screens and were constructed of new Schedule 40 PVC. All well materials and down-hole drilling equipment were steam-cleaned prior to use. The annulus around the screen was gravel-packed, bentonite pellets were installed above the gravel pack, and bentonite slurry was tremied into the remaining annulus of the borehole. The wells were developed for one hour and the water was virtually free of sediment. Locking steel protective casings were cemented around the wells. Fellows Read & Associates, Inc. surveyed the well locations and elevations. Well construction details are summarized on

Table 1. The construction logs, including development data, are included in Appendix A.

Installation of Piezometers and Recovery Well

In preparation for an aquifer test, five 1-1/4 inch diameter piezometers, designated P18 through P22, and a 6-inch diameter well, designated RW-1, were installed at the locations shown on Figure 4. Four of the piezometers (P18 through P21) are aligned perpendicular to the direction of ground-water flow at 50 ft spacings, two on either side of RW-1, to bound the width of the TCE plume in that area, as determined from the well point investigation. As discussed in the following section, the piezometers were sampled and laboratory-analyzed twice for VOCs to verify the well point results. The two piezometers furthest from RW-1 (P18 and P21) essentially bound the width of the plume. P21 had concentrations of TCE of 1.1 ug/L and < 1.0 ug/L. P18 had concentrations of TCE of 27 and 31 ug/L; these values are more than two orders of magnitude less than the concentrations at P19, which is only 50 ft closer to the plume centerline. Water-level data that are collected from the line of piezometers P18 through P21 demonstrated the range of hydraulic control while pumping RW-1. Piezometer P22 is located 200 ft downgradient from RW-1 to evaluate the hydraulic influence in the downgradient direction while pumping RW-1.

Table 1 summarizes the construction details of the piezometers and RW-1. The screens of the piezometers correspond to the center of the screen of RW-1 to accurately reflect hydraulic head pressures in the pumping zone. The piezometers consist of 1-1/4 inch diameter, 3-ft long stainless-steel screens attached to black steel casing. The piezometers were installed in boreholes that had been drilled the full depth with 3-inch diameter solid-stem augers. The annular space above the water table was sealed with bentonite pellets and grout and the piezometers were developed with a centrifugal pump. The materials and the augers were steam-cleaned prior to use. Construction logs, including development data, are included in Appendix A.

RW-1 was drilled by the mud rotary method with the collection of split-spoon samples at 5-ft intervals. The lithologic log prepared during the drilling is included in

Appendix A. The screen was installed from 35 to 55 ft below land surface to intercept the depth interval where TCE had been detected during the well point study. The split-spoon samples collected from this depth were sieved by Johnson Filtration Systems, Inc. of St. Paul, Minnesota. Based on the sieve analysis, a 6-inch diameter, 20 slot, stainless-steel, wire-wrapped screen was used and was threaded to black steel riser pipe. RW-1 was developed to remove all fine sediments and maximize the well efficiency. A construction log for RW-1, including development data, is included in Appendix A.

Locking steel protective covers were installed on the piezometers and RW-1. Absecon Electric Motor Works performed the drilling under the direction of a Geraghty & Miller hydrogeologist. Fellows Read & Associates, Inc. surveyed the elevations and locations.

Aquifer Test

During December 6 through 8, 1988, an aquifer test was performed by pumping RW-1 at a constant rate of 122 gallons per minute (gpm) for 42 hours. The purpose of the test was to determine the minimum pumping rate that was required to create a cone of depression to capture the full width of the plume, as defined by Piezometers P18 and P21. During the test, water-level drawdowns were measured in surrounding monitoring wells and piezometers. The data were analyzed by two methods. The first method was based on the drawdowns observed during the test and predicted the discharge rate that would produce a cone of depression of the required size. The second method employed a Theis analysis to evaluate and corroborate the results obtained from the empirical data. Details about the methodology of the test, the results, and the conclusions are included in Appendix B; the document was previously submitted to the NJDEP as an appendix to the preliminary ground-water remediation design report (Eder, 1989).

Determination of Ground-Water Flow Direction

To determine the direction of ground-water flow within the entire area of the

investigation, the designated water-level measuring points on the tops of the casings of the monitoring wells, RW-1, the piezometers, and selected well points were surveyed to the nearest 0.01 ft relative to mean sea level. A synoptic round of water level measurements was collected on February 22, 1990 using a steel tape and chalk. The resulting water-level elevation data, presented on Table 2, were used to construct a water-level contour map (Figure 4).

Laboratory Analyses of Ground-Water Samples

Five monitoring wells at the Lenox China facility are analyzed for VOCs on a quarterly basis as a requirement of the facility's NJPDES permit. These wells are designated 1, 3, 6, 9, and 10, and their locations are shown on Figure 2. During July 1988, in addition to the NJPDES wells, Monitoring Wells 11, 12S, 12D, 13, 14S, 14D, and 15 were sampled and analyzed for VOCs by USEPA Method 624, and in September 1988, Monitoring Wells 11, 16, and 17 and Piezometers P18 through P22 were sampled and analyzed for halogenated VOCs by USEPA Method 601; York Laboratory of Monroe, Connecticut performed the analyses for the NJPDES wells and Erco Laboratory in Cambridge, Massachusetts performed the other analyses. In November 1988, in addition to the NJPDES sampling, Monitoring Wells 11, 12S, 12D, 13, 14S, 14D, 15, 16, 17, 23, 24, and 25 and Piezometers P18 through P22 were sampled and analyzed for halogenated VOCs. During January 1990, Monitoring Well 25 and Well Point B31 were sampled and analyzed for halogenated VOCs. All samples were collected by Geraghty & Miller field scientists in accordance with established sampling procedures (USEPA, 1986).

Soil Sampling

On December 7, 1989, six soil borings were drilled around the periphery of the Drum Storage Pad at the locations shown on Figure 5. A total of 19 soil samples, representing three depths above the water table and a replicate sample, were collected in accordance with the NJDEP-approved sampling plan that was prepared as a requirement of closing the RCRA unit. York Laboratories, Inc. of Monroe, Connecticut, a New

Jersey-certified laboratory, analyzed the samples for lead and VOCs. On April 5, 1990, four soil borings were drilled around the periphery of the present Degreaser Sump at the locations shown on Figure 6. A total of eight soil samples, representing two depths above the water table, were collected in the same manner as the samples from the Drum Storage Pad area. The samples were submitted to Erco Laboratory in Cambridge, Massachusetts for analysis of halogenated VOCs by USEPA Method 601. On July 12, 1990, four borings were drilled into the subsurface below the floor of the shipping warehouse in the location of the former Degreaser Sump. The locations of these borings, designated WH1 through WH4 are shown on Figure 6. The former sump was located approximately 20 ft southeast of the present sump and was relocated in 1979 when the warehouse was constructed. One soil sample was collected at each boring location at a depth above the water table. The samples were submitted to Enseco East Laboratory in Somerset, New Jersey for analysis of halogenated VOCs by USEPA Method 601.

PHYSICAL RESULTS OF INVESTIGATION

The data collected during this investigation confirmed the existing information about the site. The area is underlain by the Cohansey Sand and the Kirkwood Formation, a tan and yellowish-orange unconsolidated sand and gravel deposit interbedded with varying amounts of silt and clay. A discontinuous clay layer that varies in thickness from 1 to 3 ft occurs at a depth of approximately 70 ft in the study area. None of the borings extended deep enough to verify previous studies (Zapecza, 1984) that a low permeability clay and silt unit occurring at a depth of approximately 250 ft below land surface marks the lower boundary of the Kirkwood-Cohansey aquifer system.

Ground water flows generally from west to east, as shown on Figure 4. The depth to water is approximately 8 ft below land surface at locations west of the plant and becomes shallower to the northeast. The hydraulic gradient in the horizontal direction is approximately 0.002 ft/ft. In the vertical direction there is a downward gradient of approximately 0.005 ft/ft as measured at Well Clusters 12 and 14. Because the aquifer material has a significantly greater horizontal permeability than vertical permeability, the

dominant direction of ground-water flow is horizontal. However, the downward head provides the mechanism for the gradual downward movement of the plume as it travels horizontally. The ground-water quality data observed in the field demonstrate that as ground water flows in the horizontal direction, it descends until encountering the relatively impermeable layer at a depth of approximately 70 ft below land surface.

ANALYTICAL RESULTS OF INVESTIGATION

The chemical data collected during this investigation are summarized in this section.

Ground-Water Quality Data

The extensive amount of ground-water quality data that exists for the Lenox plant includes the July 1986 Appendix IX list of parameters for Monitoring Well 10 and three other plant monitoring wells and the seven-year record from the NJPDES quarterly sampling. These data show no evidence of VOC contaminants other than TCE and, at much lower concentrations, its natural breakdown product, 1,2-DCE, in the ground water. Furthermore, the TCE evidently originated from the Drum Storage Pad and the Degreaser Sump, the two TCE sludge handling facilities, and no other solvents are known to have been used for the degreasing process.

Table 3 summarizes all of the field and laboratory analytical results from the well point investigations, and also indicates the sampling dates and the depths that samples were collected. A comparison of these results confirms the accuracy of the portable GC. The reliability of the well point methodology was established by the comparability between the results of samples collected from monitoring wells and samples collected from well points within the same general area. Table 4 summarizes the laboratory VOC results of samples collected from the new monitoring wells and the 6 rounds of samples collected quarterly from the facility's NJPDES wells. The laboratory data sheets are included in Appendix D. The occurrence of TCE in ground water, as depicted in Figure 7, reveals two distinct plumes; one plume emanates from the area of the Drum Storage Pad and the other

emanates from the area of the Degreaser Sump.

The plume associated with the Drum Storage Pad, as defined by the 10 ug/L contour line, is approximately 1,800 ft long and has a width that ranges from 200 to 400 ft. The TCE-contaminated water occurs at a depth of approximately 40 to 60 ft below land surface at its furthest distance from the source; this section is overlain by at least 30 ft of uncontaminated water so no vapors are expected in the unsaturated (vadose) zone. The highest concentration of TCE measured in this plume, by laboratory instrumentation, was 7,300 ug/L in the 43 to 47 ft sample collected from Well Point B21. The downward hydraulic gradient is apparently not great enough to result in any significant movement of ground water through the less permeable clay material, as evidenced by the analytical results at Monitoring Well 14D (TCE was reported at <2.0 ug/L and 2.0 ug/L) compared with the results at the clustered shallower well, Monitoring Well 14S (TCE has ranged from 400 ug/L to 880 ug/L). The concentrations of TCE that have been observed in the ground water are low enough so that the density of the TCE-bearing water is not a factor in the downward movement of the plume.

The plume associated with the Degreaser Sump, at the 10 ug/L contour line, is approximately 1,900 ft long and has a maximum width of 400 ft. The plume also drops within the aquifer, to a depth of between 40 and 60 ft below land surface, and is overlain by clean water. The highest concentration of TCE measured in this plume, by the portable GC, was 1,500 ug/L in the 20 to 23 ft sample collected from Well Point B51.

Soil Quality Data

The results of the 19 soil samples collected from the area of the Drum Storage Pad are presented in Table 5 and the full Contract Laboratory Program reportables were sent to the New Jersey Department of Environmental Protection on February 1, 1990. The results of the twelve soil samples collected from the area encompassing the locations of both the former and the present Degreaser Sump are presented in Table 6 and the laboratory data sheets are included in Appendix E. The results of the soil samples from

the areas of the Drum Storage Pad and the Degreaser Sumps, former and present, show that the soils contain low or undetectable levels of TCE. Therefore, the soils are not acting as a continuing source and do not require remediation.

RECOMMENDED GROUND-WATER REMEDIAL SYSTEM

The results of the aquifer test indicate that a recovery-well system can contain and extract contaminated ground water. Based on the aquifer test results (Appendix B), a well pumping at a rate of 50 gpm would capture ground water within at least 100 ft of either side of the well. As illustrated by the water-level elevations measured in Monitoring Wells 11, 16, and 17 at the end of the aquifer test, Figure A5 of Appendix B, a pumping rate of 122 gpm captures ground water at least 500 ft downgradient of the pumping well. Based on the extent of TCE dissolved in ground water, a total of four recovery wells, including RW-1, is recommended. The proposed locations of three new recovery wells are shown on Figure 7. For each of the two plumes, an arrangement with two recovery centers is envisioned; one area of recovery would be at the furthest extent of the plume that is within Lenox property, along Aloe Street. These wells would prevent further off-site migration and recover some of the highest concentrations of TCE. The other area of recovery would be near the end of each plume; wells would be installed along Atlantic Avenue within Galloway Township property (subject to Township approval) as far in the downgradient direction as possible. RW-1 would be pumped at a rate of approximately 50 gpm and the other well located along Aloe Street would be pumped at a rate of 75 to 100 gpm; the higher pumping rate is recommended for the plume associated with the Sump because the width is somewhat greater than the plume at the location of RW-1. A total of two wells are recommended along Atlantic Avenue, one for each plume. It is anticipated that these wells would each be pumped at approximately 125 gpm to capture ground water in the downgradient direction where TCE has been detected at concentrations at or above 10 ug/L.

The proposed recovery wells will be constructed in a manner similar to RW-1. The wells will consist of 6 or 8-inch diameter wire-wrapped stainless-steel screens and steel

casings. Subject to field conditions indicating that the formation material has suitable permeability, the proposed well along Aloe Street will be screened from 35 to 55 ft below land surface and the two wells along Atlantic Avenue will be screened from 45 to 65 ft below land surface. These screen settings will allow recovery of the water containing TCE, as detected during the well point investigation.

The results of the mounding analysis (Appendix C) indicate that injection of 400 gpm into the ground within the area of the Lenox property can be feasibly accomplished by using screens that extend beyond the 1 to 2 ft thick clay layer that was encountered at several drilling locations at a depth of approximately 70 ft. Based on the analysis, locations for four proposed injection wells have been selected, as shown on Figure 7. It is assumed that three of the injection wells would be used at any one time to dispose of the treated water and that the fourth injection well would be used during periods of well maintenance.

A preliminary ground-water remediation design plan was submitted to the NJDEP (Eder, 1989) to expedite obtaining a construction permit. Based on the subsequent full delineation of the extent of TCE in ground water and the recommendations contained in this report, Eder will submit a revised plan to the NJDEP, including details of the recovery system and injection system designs, water treatment system specifications and system maintenance.

RECOMMENDED GROUND-WATER MONITORING PROGRAM

A ground-water monitoring plan (Geraghty & Miller, 1989) was submitted to the NJDEP as an addendum to the preliminary remedial design plan (Eder, 1989). This plan has been revised to reflect the most recent data and recommendations and is described below. Data collected in this monitoring program will monitor the extent of the plume, detect changes in the concentration of TCE in ground water, and evaluate the performance of the water treatment system. Sampling and analytical protocols will be consistent with the procedures described in the "Ground-Water Sampling and Analysis Plan" prepared for the facility's NJPDES monitoring wells (Geraghty & Miller, 1990).

Monitoring Locations

As required by the facility's NJPDES permit, VOCs are analyzed on a quarterly basis at Monitoring Wells 1, 3, 6, 9, and 10. Related to the TCE plume remediation, ground-water samples will be collected from each of the four recovery wells and three new monitoring wells that will be installed along the Whitehorse Pike, as shown on Figure 7. These proposed monitoring well locations are downgradient from the plumes and the screens would be set from approximately 60 to 70 ft below grade. Samples from the recovery wells and the water treatment system effluent will evaluate system performance. The recovery well samples will also provide information to determine when the individual recovery well can be turned off.

Sampling Parameters

Existing analytical data indicate that TCE and DCE are the only hazardous constituents of concern. Therefore, the monitoring program will include analysis for halogenated VOCs by USEPA Method 601. This analysis is performed by a GC, which is capable of reliably quantifying TCE and its natural degradation products, 1,2-DCE and vinyl chloride, at the low part per billion level.

Sampling Frequency

The monitoring program will be performed on a quarterly basis during the first year of operation, and on a semiannual basis thereafter. If it is determined that pumping of one of the recovery wells can be stopped prior to another recovery well because it is no longer needed for hydraulic control, a static ground-water sample will be collected from the non-operational recovery well on an annual basis.

Sampling and Quality Assurance/Quality Control Procedures

Samples will be collected in accordance with the procedures described in the "Ground-Water Sampling and Analysis Plan" (Geraghty & Miller, 1990).

Water-Level Measurements

During the first year of recovery system operation, a synoptic round of water-level measurements will be collected from all recovery and monitoring wells on a quarterly basis to evaluate the capture zones and adjust pumping rates as necessary. Thereafter, measurements will be collected semiannually, possibly at a reduced number of monitoring points, as deemed necessary to provide coverage in the areas of the plumes.

Termination of Monitoring

The determination of when to terminate monitoring will consider prevailing ground-water quality, applicable standards, technological feasibility, the value of cleanup versus consumptive use of the aquifer, and a statistical projection of the cleanup potential of the aquifer, that is, what is the lowest concentration that can be reached as a result of the recovery and treatment operations.

Respectfully submitted,

GERAGHTY & MILLER, INC.

Catherine L. Gilroy
Senior Scientist/Project Manager

Robert A. Saar, Ph.D.
Principal Consultant/Project Officer

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Table 1. Summary of Trichloroethene Concentrations in Water Samples Collected from Well Points, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well Point	Date Sampled	Sample Depth (ft below land surface)	Trichloroethene Concentration (ug/L)	
			Field	Laboratory
B-1	9/87	10-12	<50	
		14-16	<50	
		19-21	<50	
		24-26	2000	
		29-31	70	
		34-36	300	
		39-41	300	
B-2	9/87	14-16	<50	
		19-21	<50	
		24-25	4000	
		29-31	6000	
B-3	9/87	9-11	<50	
		14-16	<50	
		19-21	2000	
		24-26	3000	
B-4	9/87	9-11	<50	
		14-16	<50	
		19-21	<50	
		24-26	<50	
		29-31	90	
B-5	9/87	9-11	<50	
		14-16	<50	
		19-21	<50	
		24-26	<50	
		29-31	<50	
B-6	9/87	14-16	<50	
		19-21	<50	
		24-26	<50	
		29-31	<50	
B-7	9/87	14-16	3000	
		19-21	2000	1000

Table 1. Summary of Trichloroethene Concentrations in Water Samples Collected from Well Points, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well Point	Date Sampled	Sample Depth (ft below land surface)	Trichloroethene Concentration (ug/L)	
			Field	Laboratory
B-8	9/87	9-11	<50	
		14-16	<50	
		19-21	60	
		24-26	2000	470
B-9	9/87	14-16	<50	
		19-21	<50	
		24-26	<50	
		29-31	<50	
B-10	9/87	9-11	<50	
		14-16	<50	
		19-21	<50	
		24-26	<50	
		29-31	<50	
B-11	9/87	14-16	3000	
		19-21	3000	
		24-26	100	
		29-31	<50	
B-12	9/87	14-16	<50	
		19-21	60	
		24-26	<50	
		29-31	<50	
B-13	10/87	14-16	<50	
		19-21	<50	
		24-26	<50	
		29-31	<50	
B-14	10/87	14-16	700	
		19-21	80	
		24-26	<50	

Table 1. Summary of Trichloroethene Concentrations in Water Samples Collected from Well Points, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well Point	Date Sampled	Sample Depth (ft below land surface)	Trichloroethene Concentration (ug/L)	
			Field	Laboratory
B-15	10/87	19-21	<50	
		24-26	<50	
		29-31	70	
		34-36	800	
		37-39	3000	
B-16	10/87	24-26	<50	
		29-31	<50	
		34-36	<50	
		39-41	<50	
B-17	10/87	19-21	<50	
		24-26	<50	
		29-31	<50	
		34-36	<50	
		39-41	<50	
B-19	12/87	50-52		2.1
		60-62		2.4
		65-67		<1
		76-78		<1
		83-85		<1
B-20	12/87	40-42		6200
		45-47		490
B-21	12/87	40-42		1100
		45-47		7300
B-22	12/87	40-42		<1
B-23	12/87	50-52		180
		55-57		3000
		65-67		510

Table 1. Summary of Trichloroethene Concentrations in Water Samples Collected from Well Points, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well Point	Date Sampled	Sample Depth (ft below land surface)	Trichloroethene Concentration (ug/L)	
			Field	Laboratory
B-24	12/87	30-32	<300	
		35-37	<300	
		40-42	400	
		45-47	300	
		50-52	700	540
		55-57	<300	
		60-62	<300	
		65-67	<300	
B-25	12/87	40-42	<100	
		45-47	<100	
		50-52	<100	
		55-57	<100	1.3
		65-67	<100	
		75-77	<100	
		80-82	<100	1.4
		85-87	<100	
		90-92	<100	1.3
B-26	12/87	42-44	<100	
		50-52	<100	
		55-57	<100	
		60-62	<100	<1
		75-77	<100	
		80-82	<100	<1
		85-87	<100	
B-27	12/87	50-52	<100	<1
		55-57	<100	
		60-62	<100	
		82-84	<100	
		85-87	<100	<1

Table 1. Summary of Trichloroethene Concentrations in Water Samples Collected from Well Points, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well Point	Date Sampled	Sample Depth (ft below land surface)	Trichloroethene Concentration (ug/L)	
			Field	Laboratory
B-28	12/87	45-47	200	
		50-52	200	
		55-57	600	400
		60-62	300	
		65-67	<100	
B-29	12/87	79-81	<100	
		84-86	<100	<1
B-30 (Well 26)	1/89	30-33	<10	
		40-43	<10	
		45-48	60	
		50-53	60	44
		55-58	60	
		60-63	70	79
		65-68	60	
B-31 (Well 27)	1/89	30-33	<10	
		35-38	<10	<1
		40-43	<10	
		50-53	<10	5.9
		60-63	30	29
B-32 (Well 28)	1/89	30-33	<10	
		35-38	<10	
		40-43	<10	
		50-53	<10	<1
B-33 (Well 29)	1/89	30-33	<10	
		35-38	<10	
		40-43	<10	
		50-53	<10	
		55-58	<10	<1
		65-68	<10	<1

Table 1. Summary of Trichloroethene Concentrations in Water Samples Collected from Well Points, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well Point	Date Sampled	Sample Depth (ft below land surface)	Trichloroethene Concentration (ug/L)	
			Field	Laboratory
B-34	2/89	30-33	<10	
		35-38	<10	
		40-43	<10	
		45-48	<10	
		55-58	<10	
		60-63	<10	
		65-68	<10	
		70-73	<10	
		75-78	<10	
B-35	2/89	45-48	<10	
		55-58	<10	
		65-68	<10	<1
B-36	3/89	45-48	<10	
		55-58	<10	
		65-68	<10	
B-37	3/89	45-48	<10	
		55-58	<10	
		65-68	<10	
B-38	3/89	45-58	<10	
		55-58	<10	
		65-68	<10	
		70-73	<10	2.1
B-39	3/89	50-53	<10	
		60-63	<10	<1
		65-68	<10	
B-40	3/89	50-53	<10	1.7
		60-63	<10	
		65-68	<10	
B-41	8/89	40-43	<10	
		50-53	<10	

Table 1. Summary of Trichloroethene Concentrations in Water Samples Collected from Well Points, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well Point	Date Sampled	Sample Depth (ft below land surface)	Trichloroethene Concentration (ug/L)	
			Field	Laboratory
B-42	8/89	40-43	20	
		50-53	<10	
B-43	8/89	40-43	10	
		50-53	15	
B-44	8/89	40-43	100	
		50-53	60	
B-45	8/89	40-43	300	
		50-53	70	
B-46	8/89	40-43	200	
		50-53	10	
B-47	8/89	40-43	300	280
		50-53	40	
B-48	8/89	30-33	40	
		40-43	300	290
B-49	8/89	30-33	<10	
		40-43	10	7.6
B-50	8/89	20-23	800	840
		30-33	10	
B-51	8/89	10-13	20	
		20-23	2000	
B-52	1/90	40-43	100	
		50-53	<10	
B-53	1/90	40-43	10	
B-54	1/90	40-43	<10	<1

Table 1. Summary of Trichloroethene Concentrations in Water Samples Collected from Well Points, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well Point	Date Sampled	Sample Depth (ft below land surface)	Trichloroethene Concentration (ug/L)	
			Field	Laboratory
B-55	1/90	40-43	90	140
B-56	1/90	40-43	70	
B-57	1/90	40-43	80	
		45-48	50	79
		50-53	20	18
B-58	1/90	35-38	20	
		40-43	40	44
B-59	1/90	40-43	<10	7.9
B-60	1/90	40-43	10	8.1
		50-53	<10	
		60-63	<10	
B-61	1/90	40-43	<10	
		50-53	<10	<1
B-62	1/90	40-43	<10	
		50-53	<10	<1
		60-63	<10	
B-63	1/90	40-43	<10	
		50-53	<10	
		60-63	<10	<1
B-64	1/90	40-43	<10	
		50-53	<10	9.6
		60-63	<10	
B-65	1/90	40-43	<10	4.2
		50-53	<10	
		60-63	<10	
B-66	2/90	40-43	30	
		50-53	30	40
		60-63	<10	

Table 1. Summary of Trichloroethene Concentrations in Water Samples Collected from Well Points, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well Point	Date Sampled	Sample Depth (ft below land surface)	Trichloroethene Concentration (ug/L)	
			Field	Laboratory
B-67	2/90	40-43	<10	
		50-53	<10	
		60-63	<10	
B-68	2/90	45-48	<10	
		55-58	<10	6.6
B-69	2/90	55-58	10	
B-70	2/90	50-53	<10	<1
B-71	2/90	50-53	20	

All laboratory analyses were performed by Erco Laboratory, Cambridge Massachusetts or AnalytiKEM, Inc., Cherry Hill, New Jersey, using USEPA Method 601.

Table 2. Well Construction Details, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well	Date Installed	Screened Interval (ft below land surface)	Screen Slot Size	Diameter of Well (inches)	Elevation of Measuring Point (ft above sea level)	Land Surface Elevation (ft above sea level)
1	9/82	8-28	.020	4	69.28	67
3	9/82	9-29	.020	4	67.09	65
4	11/82	5-25	.015	4	66.96	65
P5	11/82	?-17	----	2	64.17	63
6	12/83	9-29	.016	4	65.08	63
7	12/83	5-25	.016	4	67.31	65
8	12/83	9-29	.016	4	67.16	66
9	7/86	13-28	.015	4	69.51	68
10	7/86	15-30	.015	4	63.51	62
11	6/88	50-60	.020	2	63.24	62
12S	6/88	55-65	.020	2	62.62	61
12D	6/88	80-90	.020	2	62.89	61
13	6/88	50-60	.020	2	64.66	63
14S	6/88	45-55	.020	2	63.64	62
14D	6/88	75-85	.020	2	63.63	62
15	6/88	10-20	.020	2	66.07	64
16	9/88	55-65	.020	2	62.34	60
17	9/88	55-65	.020	2	62.33	60
P18	9/88	44-47	.012	1-1/4	63.77	62
P19	9/88	44-47	.012	1-1/4	64.04	62
P20	9/88	44-47	.012	1-1/4	64.43	62
P21	9/88	40-43	.012	1-1/4	64.24	62
P22	9/88	44-47	.012	1-1/4	63.30	61
23	10/88	55-65	.020	2	61.44	59
24	10/88	55-65	.020	2	62.79	61
25	10/88	55-65	.020	2	61.32	59
B30	1/89	65-68	.008	1-1/4	62.01	60
B31	1/89	60-63	.008	1-1/4	61.86	60
B32	1/89	50-53	.008	1-1/4	62.99	61
B33	1/89	65-68	.012	1-1/4	62.01	60
B52	1/90	50-53	.008	1-1/4	61.02	59
B53	1/90	40-43	.008	1-1/4	61.51	60
B54	1/90	40-43	.008	1-1/4	61.56	60
B55	1/90	40-43	.008	1-1/4	61.71	60
B56	1/90	40-43	.008	1-1/4	61.03	59
B57	1/90	50-53	.008	1-1/4	60.43	58
B58	1/90	40-43	.008	1-1/4	60.58	59
B59	1/90	40-43	.008	1-1/4	59.95	58
B65	1/90	60-63	.008	1-1/4	61.78	60
RW-1	11/88	35-55	.020	6	62.25	61

P indicated a piezometer installed initially to collect water-level data.

B indicates a well point installed initially to collect samples for field analyses.

RW indicates a recovery well installed to pump ground water.

The 2-inch and 4-inch diameter wells are constructed of Schedule 40 PVC screens and casing. The 1-1/4 inch diameter wells and RW-1 are constructed with stainless-steel screens and black steel casings.

Well 12D has a 6-inch diameter black steel surface casing to a depth of 70.5 ft.

The measuring point is the top of the well casing.

Table 3. Concentrations of Volatile Organic Compounds Detected in Ground Water Samples Collected from Wells and Piezometers, July 1988 to January 1990, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well	Date	Lab	1,1-Dichloroethane	Methylene Chloride	1,2-Dichloroethene	Trichloroethene	Chloroform	1,1,1-Trichloroethane	Chlorobenzene
1	8/17/88	A	<1	1.9	<1	<1	<1	<1	<1
	11/16/88	Y	<5	<5	<10	<1	<5	<5	<5
	2/7/89	Y	<5	<5	<5	<1	<5	<5	<5
	5/9/89	Y	<5	<5	<5	<1	<5	<5	<5
	8/3/89	Y	<5	<5	<5	<1	<5	<5	<5
	11/14/89	Y	<5	<5	<5	<1	<5	<5	<5
	11/14/89	Y	<5	<5	<5	<1	<5	<5	<5
3	8/17/88	A	<1	1.3	<1	<1	<1	<1	<1
	11/16/88	Y	<5	<5	<10	<1	<5	<5	<5
	2/7/89	Y	<5	<5	<5	<1	<5	<5	<5
	5/9/89	Y	<5	<5	<5	<1	<5	<5	<5
	8/3/89	Y	<5	<5	<5	<1	<5	<5	<5
	11/14/89	Y	<5	<5	<5	<1	<5	<5	<5
6	8/17/88	A	<1	1.2	<1	<1	<1	<1	<1
	11/16/88	Y	<5	<5	<10	<1	<5	<5	<5
	2/7/89	Y	<5	<5	<5	<1	<5	<5	<5
	5/9/89	Y	<5	<5	<5	<1	<5	<5	<5
	8/3/89	Y	<5	<5	<5	<1	<5	<5	<5
	11/14/89	Y	<5	<5	<5	<1	<5	<5	<5
9	8/17/88	A	<1	1.8	<1	<1	<1	<1	<1
	11/16/88	Y	<5	<5	<10	<1	<5	<5	<5
	2/7/89	Y	<5	<5	<5	<1	<5	<5	<5
	5/9/89	Y	<5	<5	<5	<1	<5	<5	<5
	8/3/89	Y	<5	<5	<5	<1	<5	<5	<5
	11/14/89	Y	<5	<5	<5	<1	<5	<5	<5
10	7/5/88	E	<20	180	120	1,400	<20	<20	<20
	8/17/88	A	<50	<50	75	880	<50	<50	<50
	11/16/88	Y	<5	<5	83	560	<5	<5	<5
	2/7/89	Y	<5	<5	110	720	<5	<5	<5
	5/9/89	Y	<5	<5	650	540	<5	<5	<5
	5/9/89	Y	<5	<5	71	590	<5	<5	<5
	8/3/89	Y	<5	<5	<5	5	<5	<5	<5
	8/3/89	Y	<5	<5	<5	6	<5	<5	<5
	11/4/89	Y	<5	<5	23	170	<5	<5	<5
11	7/5/88	E	<2	5.1	2.3	100	<2	<2	<2
	9/22/88	E	<1	<5	1.0	44	<1	<1	<5
	11/17/88	E	<1	5.5	<1	49	<1	<1	<5
12S	7/5/88	E	<2	5.2	<2	<2	5.2	<2	<2
	11/17/88	E	<1	13	<1	2.0	5.2	<1	<5

A AnalytiKEM Inc., Cherry Hill, New Jersey.
E Erco Laboratory, Cambridge, Massachusetts.
Y York Laboratories, Monroe, Connecticut.
Concentrations: Micrograms per Liter (ug/L)

Table 3. Concentrations of Volatile Organic Compounds Detected in Ground Water Samples Collected from Wells and Piezometers, July 1988 to January 1990, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well	Date	Lab	1,1-Dichloroethane	Methylene Chloride	1,2-Dichloroethene	Trichloroethene	Chloroform	1,1,1-Trichloroethane	Chlorobenzene
12D	7/5/88	E	<2	<5	<2	<2	<2	<2	<2
	7/5/88	E	<2	6.8	<2	<2	<2	<2	<2
	11/17/88	E	<1	9.7	<1	<2	2.3	<1	<5
13	7/5/88	E	<2	<5	<2	<2	14	<2	<2
	11/16/88	E	<1	<5	<1	19	15	<1	<5
14S	7/5/88	E	<20	59	<20	500	<20	<20	<20
	7/5/88	E	<20	<50	<20	880	<20	<20	<20
	11/16/88	E	<10	<50	<10	400	<10	<10	<50
14D	7/5/88	E	<2	8.6	<2	<2	<2	<2	<2
	11/16/88	E	<1	<10	<1	2.0	<1	<1	<5
15	7/5/88	E	<2	5.0	8.0	<2	<2	<2	<2
	11/16/88	E	<1	21	19	68	<1	1.7	<5
16	9/22/88	E	<1	<5	<1	87	<1	<1	<5
	11/17/88	E	<1	6.5	<1	78	1.4	<1	<5
17	9/22/88	E	<1	<5	3.8	110	<1	<1	<5
	11/17/88	E	<1	12	<1	58	<1	<1	<5
	1/10/90	E	<1	<5	<1	3.6	<1	<1	<5
P18	9/23/88	E	<1	<5	<1	27	<1	<1	<5
	11/17/88	E	<1	<5	1.7	31	<1	<1	<5
P19	9/23/88	E	1.2	<5	28	6,800	<1	4.2	<5
	11/17/88	E	<100	<1,000	<100	7,700	<100	<100	<500
	11/17/88	E	<100	<1,000	<100	6,300	<100	<100	<500
P20	9/23/88	E	<1	<5	1.1	2,200	<1	1.0	<5
	11/17/88	E	<1	6.2	2.6	2,100	<1	<1	<5
P21	9/23/88	E	<1	<5	<1	1.1	<1	<1	<5
	11/17/88	E	<1	<10	<1	<1	<1	<1	<5
P22	9/23/88	E	2.0	10	6.6	2,300	<1	<1	1.5
	11/17/88	E	<1	<5	2.9	2,000	<1	1.0	<5
23	11/17/88	E	<1	8.3	4.2	240	1.1	<1	<5
	11/17/88	E	<1	<5	3.2	210	<1	<1	<5
24	11/17/88	E	<1	<10	<1	<1	12	<1	<5

A AnalytiKEM Inc., Cherry Hill, New Jersey.
E Erco Laboratory, Cambridge, Massachusetts.
Y York Laboratories, Monroe, Connecticut.
Concentrations: Micrograms per Liter (ug/L)

Table 3. Concentrations of Volatile Organic Compounds Detected in Ground Water Samples Collected from Wells and Piezometers, July 1988 to January 1990, Lenox China Facility and Adjacent Area, Pomona, New Jersey.

Well	Date	Lab	1,1-Dichloroethane	Methylene Chloride	1,2-Dichloroethene	Trichloroethene	Chloroform	1,1,1-Trichloroethane	Chlorobenzene
25	11/17/88	E	<1	<10	<1	3.0	<1	<1	<5
	1/10/90	E	<1	5.3	1.6	8.8	<1	<1	<5
RW-1 (9:00)	12/6/88	E	<5	<25	<5	800	<5	<5	<5
(24:15)	12/7/88	E	<1	<10	<1	1,200	<1	1.1	1.7
(12:30)	12/7/88	E	<50	<250	<50	1,100	<50	<50	<250
(24:05)	12/8/88	E	<10	<50	<10	820	<10	<10	<50
(6:10)	12/8/88	E	<1	<10	5.5	910	<1	<1	<5
B31	1/10/90	E	<1	<5	1.8	15	<1	<1	<5

A AnalytiKEM Inc., Cherry Hill, New Jersey.
E Erco Laboratory, Cambridge, Massachusetts.
Y York Laboratories, Monroe, Connecticut.
Concentrations: Micrograms per Liter (ug/L)

Table 4. Water-Level Elevations at the, Lenox China Facility and Adjacent Area, February 22, 1990, Pomona, New Jersey.

Well	Elevation of Measuring Point (feet above sea level)	Depth to Water (feet below measuring point)	Water-Level Elevation (feet above sea level)
1	69.28	10.10	59.18
3	67.09	8.32	58.77
4	66.96	6.91	60.05
P5	64.17	5.95	58.22
6	65.08	6.87	58.21
7	67.31	8.15	59.16
8	67.16	7.48	59.68
9	69.51	11.16	58.35
10	63.51	5.44	58.07
11	63.24	5.67	57.57
12S	62.62	5.04	57.58
12D	62.89	5.45	57.44
13	64.66	6.87	57.79
14S	63.64	5.77	57.87
14D	63.63	5.91	57.72
15	66.07	7.50	58.57
16	62.34	4.78	57.56
17	62.33	4.68	57.65
P18	63.77	5.79	57.98
P19	64.04	6.10	57.94
P20	64.43	6.47	57.96
P21	64.24	6.23	58.01
P22	63.30	5.49	57.81
23	61.44	4.08	57.36
24	62.79	5.39	57.40
25	61.32	3.94	57.38
B30	62.01	4.75	57.26
B31	61.86	4.64	57.22
B32	62.99	5.76	57.23
B33	62.01	4.88	57.13
B52	61.02	3.33	57.69
B53	61.51	3.83	57.68
B54	61.56	3.83	57.73
B55	61.71	3.97	57.74
B56	61.03	3.42	57.61
B57	60.43	2.95	57.48
B58	60.58	3.26	57.32
B59	59.95	2.58	57.37
B65	61.78	4.01	57.77
RW-1	62.25	6.36	55.89

Table 5. Results of Analyses for Volatile Organic Compounds in Soil Samples, December 7, 1989, Drum Storage Pad, Lenox China, Pomona, New Jersey.

Boring:	1			2		
Sample Number:	S1	S2	S3	S1	S2	S3
Compound						
Chloromethane	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10
Methylene Chloride	4 JB	3 JB	<5	<5	<5	<5
Acetone	83 B	37 B	34 B	8 JB	14 B	14 B
Carbon Disulfide	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5
1,2-Dichloroethene (total)	<5	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5
2-Butanone	5 JB	6 JB	3 J	2 J	3 J	3 J
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5
Vinyl Acetate	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5
cis-1,3-Dichloropropene	<5	<5	<5	<5	<5	<5
Trichloroethene	<5	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5
Benzene	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	<5	<5	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5	<5	<5
4-Methyl-2-pentanone	<10	<10	<10	<10	<10	<10
2-Hexanone	<10	<10	<10	<10	<10	<10
Tetrachloroethene	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5
Toluene	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5
Styrene	<5	<5	<5	<5	<5	<5
Xylene (total)	<5	<5	<5	<5	<5	<5

NOTE: The depths of all soil samples below land surface are as follows:

S1 - 0 to 1.5 ft
S2 - 3.5 to 5 ft
S3 - 5 to 7 ft

Concentrations: Micrograms per kilogram (ug/kg) (ppb).

J Estimated concentration.
B Analyte found in blank.

Table 5. Results of Analyses for Volatile Organic Compounds in Soil Samples, December 7, 1989, Drum Storage Pad, Lenox China, Pomona, New Jersey.

Boring:	3			4		
Sample Number:	S1	S2	S3	S1	S2	S3
Compound						
Chloromethane	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10
Methylene Chloride	2 JB	<5	<5	8 JB	6 JB	8 JB
Acetone	21 B	13 B	15 JB	<5	<5	<5
Carbon Disulfide	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5
1,2-Dichloroethene (total)	<5	<5	<5	<5	<5	<5
Chloroform	2 J	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	2 J	0.9 J	2 J
2-Butanone	7 JB	2 J	2 J	7	<5	<5
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<10	<10	<10
Vinyl Acetate	<5	<10	<10	<5	<5	<5
Bromodichloromethane	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5
cis-1,3-Dichloropropene	<5	<5	<5	17	<5	<5
Trichloroethene	13	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5
Benzene	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	<5	<5	<5	<5	<5	<5
Bromoform	<5	<5	<5	<10	<10	<10
4-Methyl-2-pentanone	<10	<10	<10	<10	<10	<10
2-Hexanone	<10	<10	<10	2 J	<5	<5
Tetrachloroethene	6 J	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5
Toluene	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5
Styrene	<5	<5	<5	<5	<5	<5
Xylene (total)	<5	<5	<5	5	<5	<5

NOTE: The depths of all soil samples below land surface are as follows:

S1 - 0 to 1.5 ft
S2 - 3.5 to 5 ft
S3 - 5 to 7 ft

Concentrations: Micrograms per kilogram (ug/kg) (ppb).

J Estimated concentration.
B Analyte found in blank.

Table 5. Results of Analyses for Volatile Organic Compounds in Soil Samples, December 7, 1989, Drum Storage Pad, Lenox China, Pomona, New Jersey.

Boring:	5				6		
Sample Number:	S1	S2	S3	S3 Replicate	S1	S2	S3
Compound							
Chloromethane	<10	<10	<10	<10	<10	<10	<10
Bromomethane	<10	<10	<10	<10	<10	<10	<10
Vinyl Chloride	<10	<10	<10	<10	<10	<10	<10
Chloroethane	<10	<10	<10	<10	<10	<10	<10
Methylene Chloride	5 B	4 JB	<5	3 JB	3 JB	3 JB	4 JB
Acetone	17 B	41 B	27 B	22 B	21 B	21 B	62 B
Carbon Disulfide	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethene	<5	<5	<5	<5	<5	<5	<5
1,1-Dichloroethane	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethene (total)	2 J	<5	<5	<5	<5	<5	<5
Chloroform	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloroethane	<5	<5	<5	<5	<5	<5	<5
2-Butanone	2 J	3 J	3 J	2 J	1 J	2 J	3 J
1,1,1-Trichloroethane	<5	<5	<5	<5	<5	<5	<5
Carbon Tetrachloride	<5	<5	<5	<5	<5	<5	<5
Vinyl Acetate	<10	<10	<10	<10	<10	<10	<10
Bromodichloromethane	<5	<5	<5	<5	<5	<5	<5
1,2-Dichloropropane	<5	<5	<5	<5	<5	<5	<5
cis-1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5
Trichloroethene	17	<5	<5	<5	<5	<5	<5
Dibromochloromethane	<5	<5	<5	<5	<5	<5	<5
1,1,2-Trichloroethane	<5	<5	<5	<5	<5	<5	<5
Benzene	<5	<5	<5	<5	<5	<5	<5
trans-1,3-Dichloropropene	<5	<5	<5	<5	<5	<5	<5
Bromoform	<5	<5	<5	<5	<5	<5	<5
4-Methyl-2-pentanone	<10	<10	<10	<10	<10	<10	<10
2-Hexanone	<10	<10	<10	<10	<10	<10	<10
Tetrachloroethene	4 J	<5	<5	<5	<5	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5	<5	<5	<5	<5	<5
Toluene	<5	<5	<5	<5	<5	<5	<5
Chlorobenzene	<5	<5	<5	<5	<5	<5	<5
Ethylbenzene	<5	<5	<5	<5	<5	<5	<5
Styrene	<5	<5	<5	<5	<5	<5	<5
Xylene (total)	<5	<5	<5	<5	<5	<5	<5

NOTE: The depths of all soil samples below land surface are as follows:

S1 - 0 to 1.5 ft
S2 - 3.5 to 5 ft
S3 - 5 to 7 ft

Concentrations: Micrograms per kilogram (ug/kg) (ppb).

J Estimated concentration.
B Analyte found in blank.

Table 5. Results of Analyses for Volatile Organic Compounds in Soil Samples, December 7, 1989, Drum Storage Pad, Lenox China, Pomona, New Jersey.

Boring: / Sample Number:	Field Blank	Trip Blank
Compound		
Chloromethane	<10	<10
Bromomethane	<10	<10
Vinyl Chloride	<10	<10
Chloroethane	<10	<10
Methylene Chloride	<5	<5
Acetone	9 JB	3 JB
Carbon Disulfide	<5	<5
1,1-Dichloroethene	<5	<5
1,1-Dichloroethane	<5	<5
1,2-Dichloroethene (total)	<5	<5
Chloroform	<5	<5
1,2-Dichloroethane	<5	<5
2-Butanone	<5	<5
1,1,1-Trichloroethane	<5	<5
Carbon Tetrachloride	<5	<5
Vinyl Acetate	<10	<10
Bromodichloromethane	<5	<5
1,2-Dichloropropane	<5	<5
cis-1,3-Dichloropropene	<5	<5
Trichloroethene	<5	<5
Dibromochloromethane	<5	<5
1,1,2-Trichloroethane	<5	<5
Benzene	<5	<5
trans-1,3-Dichloropropene	<5	<5
Bromoform	<5	<5
4-Methyl-2-pentanone	<10	<10
2-Hexanone	<10	<10
Tetrachloroethene	<5	<5
1,1,2,2-Tetrachloroethane	<5	<5
Toluene	2 J	0.8 J
Chlorobenzene	<5	<5
Ethylbenzene	<5	<5
Styrene	<5	<5
Xylene (total)	0.9 J	<5

NOTE: The depths of all soil samples below land surface are as follows:

S1 - 0 to 1.5 ft
S2 - 3.5 to 5 ft
S3 - 5 to 7 ft

Concentrations: Micrograms per kilogram (ug/kg) (ppb).

J Estimated concentration.
B Analyte found in blank.

Table 6. Concentrations of Trichloroethene in Soil Samples Collected Around Degreaser Sump, Lenox China, Pomona, New Jersey.

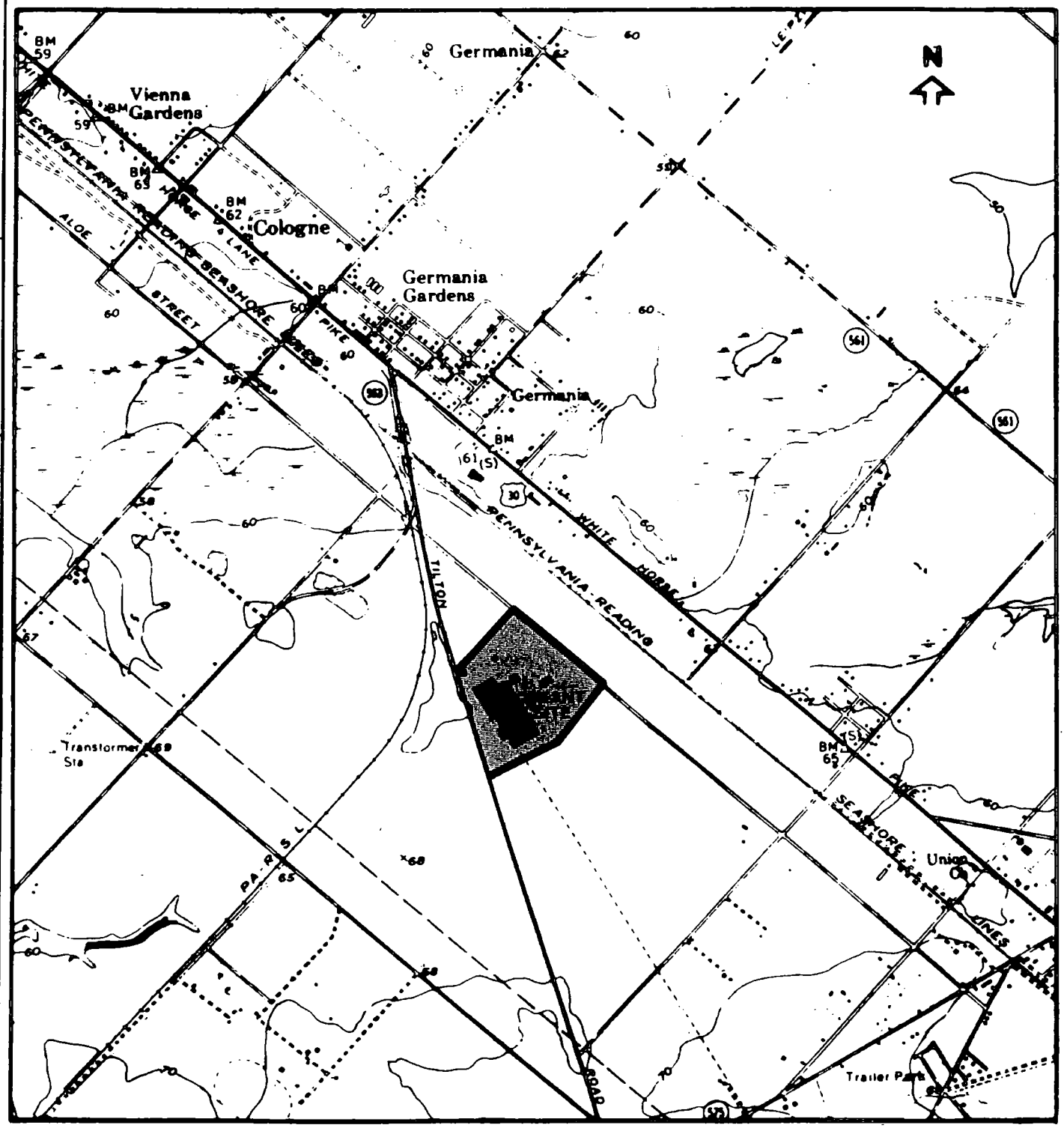
Sample I.D.	Date Sampled	Depth (ft below grade)	Trichloroethene (ppb) Field	Laboratory
DS-1	4/5/90	0.0-0.5	90	20
		7.5-8.0	<10	<1.1
DS-2	4/5/90	0.0-0.5	<10	<1.3
		6.5-7.0	<10	<1.3
DS-3	4/5/90	0.0-0.5	<10	<1.2
		6.5-7.0	<10	<1.2
DS-4	4/5/90	0.0-0.5	<10	<1.2
		7.5-8.0	<10	<1.3
WH-1	7/12/90	6.5-7.0	NA	<0.1
WH-2	7/12/90	5.0-5.5	NA	<0.1
WH-3	7/12/90	5.5-6.0	NA	190
WH-4	7/12/90	6.0-6.5	NA	1300

Field results represent soil sample headspace analyses using a portable gas chromatograph.
Laboratory results measured by Erco Laboratory in Cambridge, Massachusetts.

NA Not Analyzed.

#NJ11716/COT.WK1

156764



DRAFTER: PADULA
MGR.: GILROY
COMPILER: GILROY
CAD FILE: NON-CAD
FILE NO.:
PROJCT. NO.:
DATE: AUG 90

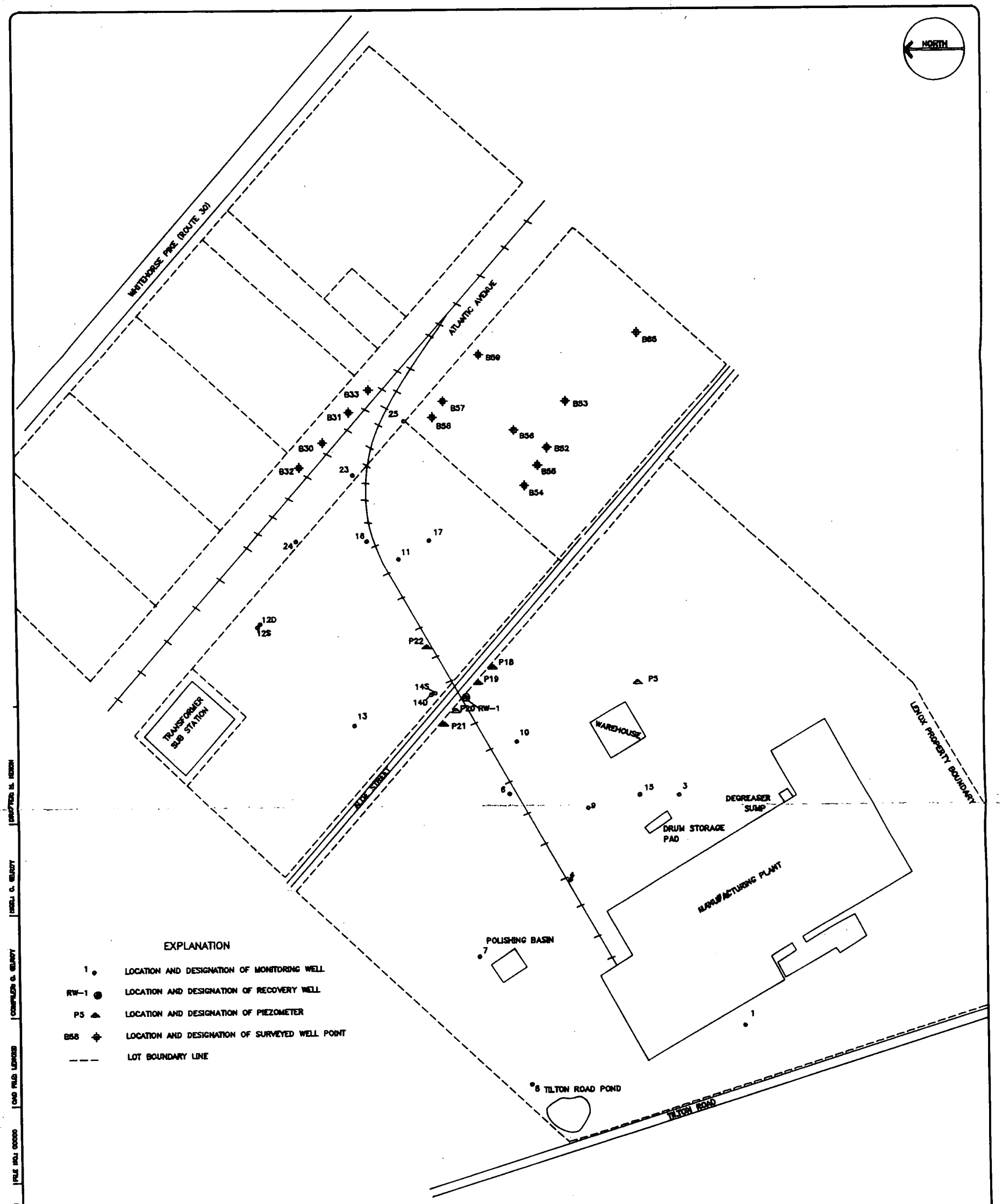
SCALE 0 2000 Ft.

GERAGHTY & MILLER, INC.
Environmental Services

LOCATION OF LENOX CHINA PLANT SITE

LENOX CHINA POMONA, NEW JERSEY

FIGURE 1

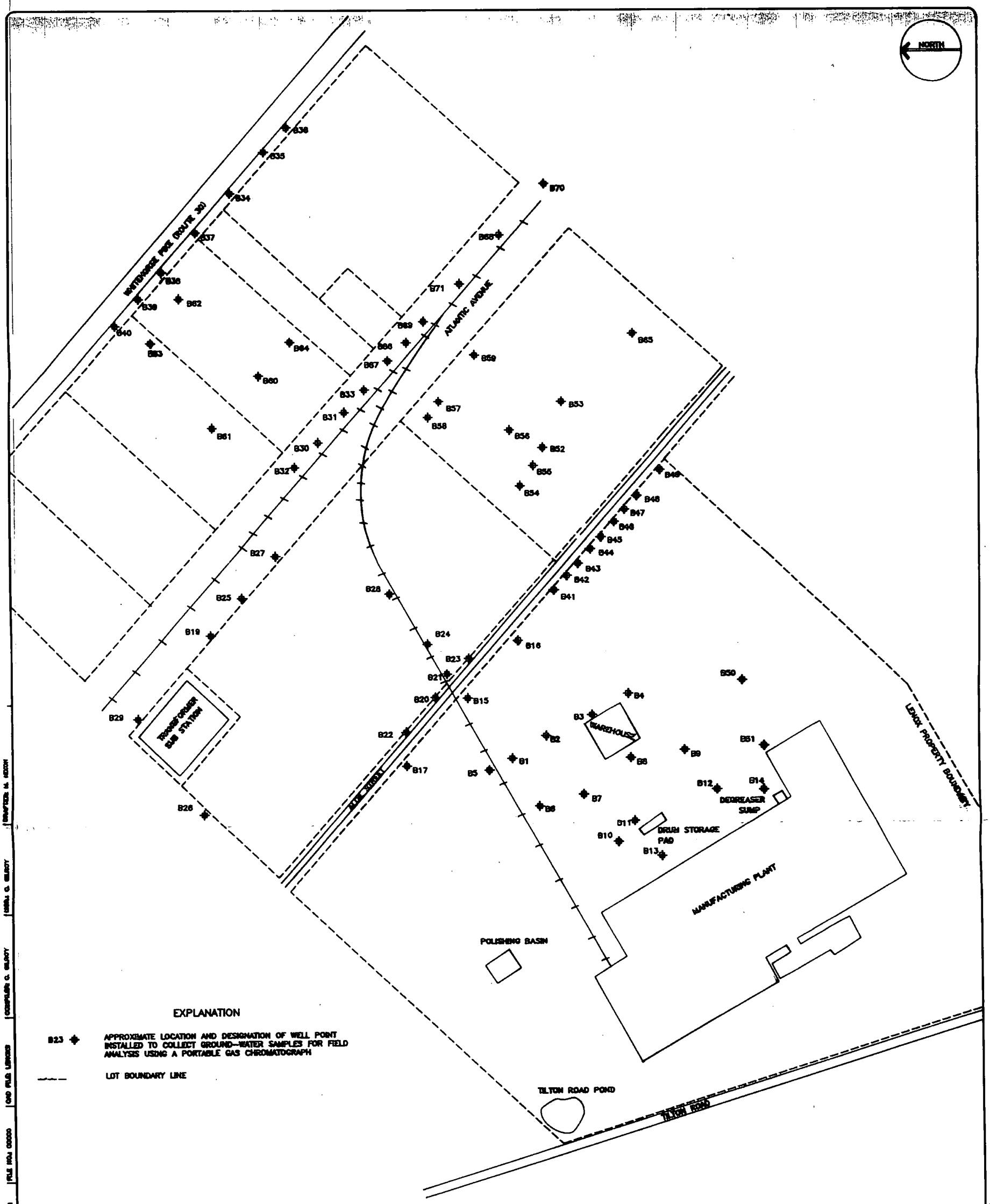


GERAGHTY & MILLER, INC.
Environmental Services

SITE MAP

LENOX CHINA, POMONA, NEW JERSEY

FIGURE
2



EXPLANATION

B23 ✦ APPROXIMATE LOCATION AND DESIGNATION OF WELL POINT INSTALLED TO COLLECT GROUND-WATER SAMPLES FOR FIELD ANALYSIS USING A PORTABLE GAS CHROMATOGRAPH

LOT BOUNDARY LINE

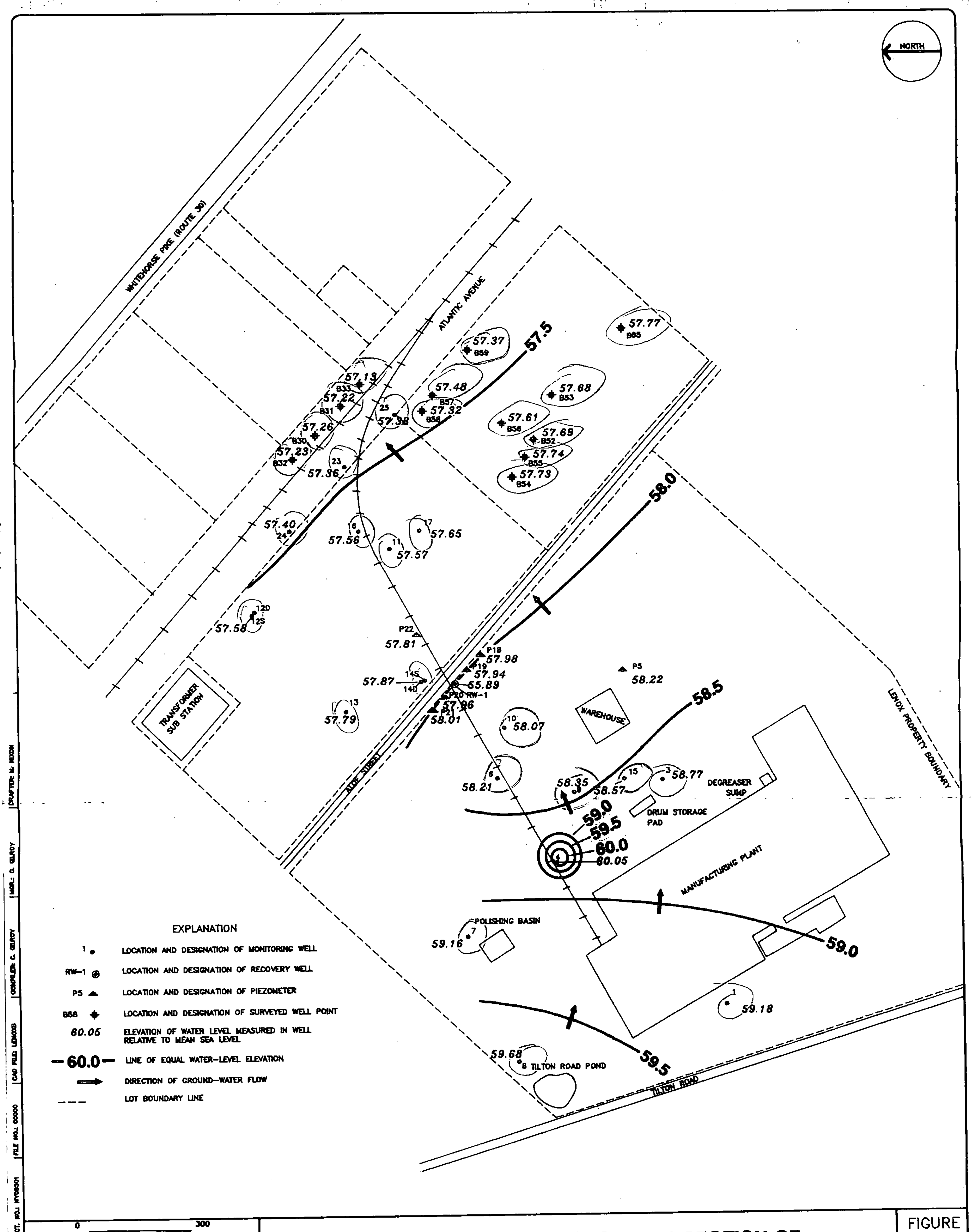
0 300
SCALE FEET

GERAGHTY & MILLER, INC.
Environmental Services

LOCATIONS OF WELL POINTS INSTALLED TO INVESTIGATE TRICHLOROETHENE IN GROUND WATER

LENOX CHINA, POMONA, NEW JERSEY

FIGURE 3



GERAGHTY & MILLER, INC.
Environmental Services

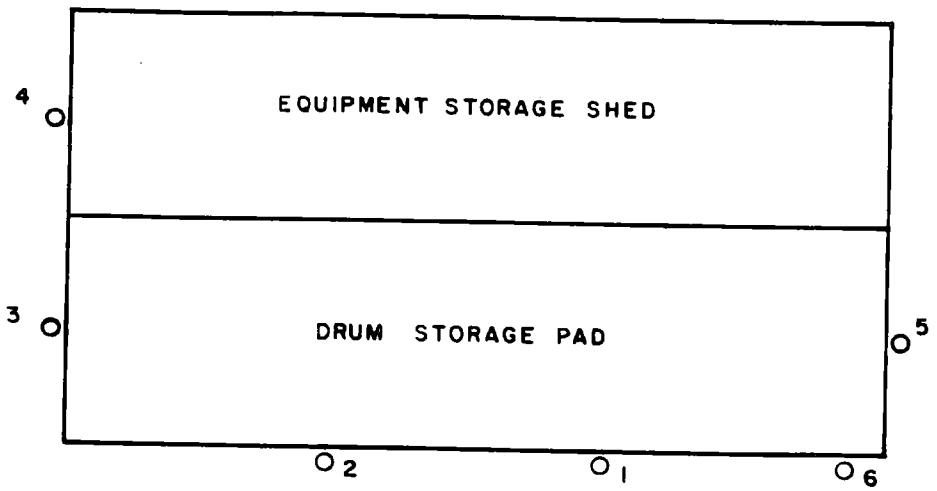
WATER LEVEL ELEVATIONS AND DIRECTION OF GROUND-WATER FLOW, FEBRUARY 22, 1990

LENOX CHINA, POMONA, NEW JERSEY

FIGURE 4

GERAGHTY & MILLER, INC.
Ground-Water Consultants

COMPILED BY: C. GILROY	DATE: 2/89	SCALE: SHOWN	PREPARED FOR: LENOX CHINA
PREPARED BY: E. DeLUCA	FILE NO: NY08201-1036		Pomona, New Jersey
PROJECT MGR.: R. SAAR			



0 20 FT
SCALE

EXPLANATION

2 ○ LOCATION AND DESIGNATION OF SOIL BORINGS DRILLED ON DECEMBER 7, 1989

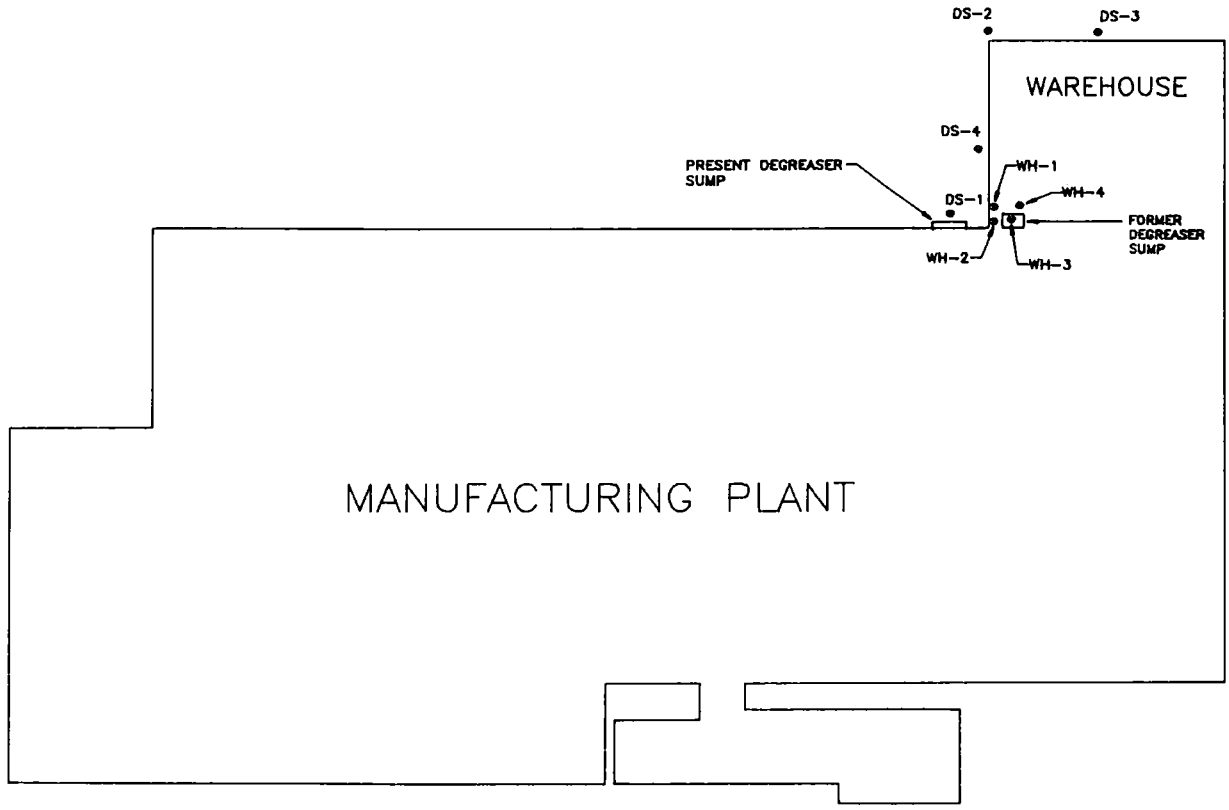
SUBJECT:

SOIL SAMPLING LOCATIONS, TCE DRUM STORAGE PAD

FIGURE 5

141991

DRAFTER: M. NIXON | MGR.: C. GILROY | COMPILER: C. GILROY | CAD FILE: LENBLDG | FILE NO.: 00000 | PRJCT. NO.: NJ11716 | DATE: 29AUG1990



EXPLANATION

DS-1 • LOCATION AND DESIGNATION OF SOIL BORING

NOTES

BORINGS DS-1 THROUGH DS-4 WERE DRILLED ON APRIL 5, 1990.
BORINGS WH-1 THROUGH WH-4 WERE DRILLED ON JULY 12, 1990.

0 SCALE 300 FEET

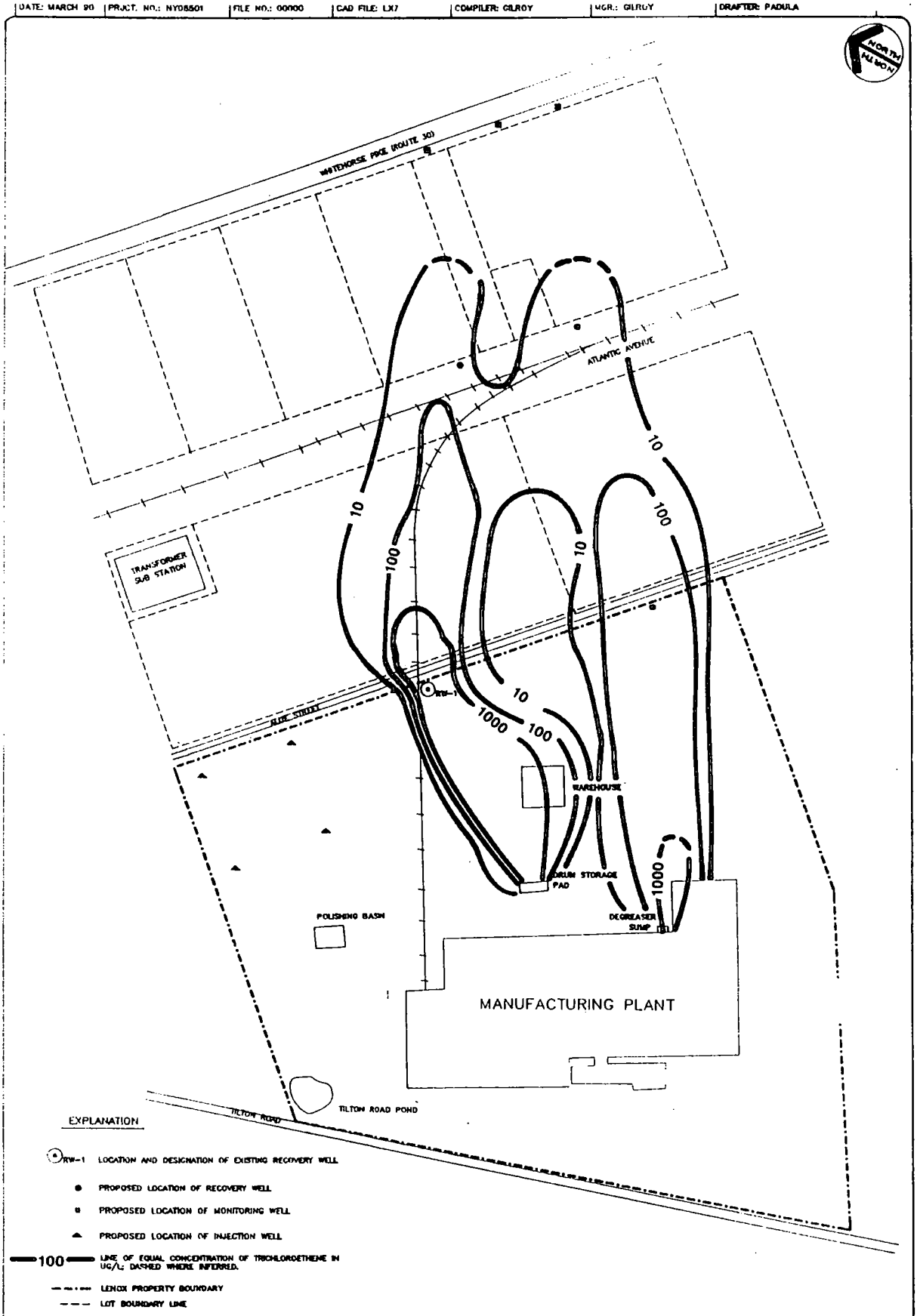
GERAGHTY & MILLER, INC.
Environmental Services

LOCATIONS OF SOIL BORINGS COLLECTED FROM AREA OF SLUDGE DEGREASER SUMP

LENOX CHINA, POMONA, NEW JERSEY

FIGURE 6

DATE: MARCH 90	PROJ. NO.: NY08501	FILE NO.: 00000	CAD FILE: LX7	COMPILER: GILROY	MGR.: GILROY	DRAFTER: PADULA



GERAGHTY & MILLER, INC.
Environmental Services

EXTENT OF TRICHLOROETHENE IN GROUND WATER AND PROPOSED LOCATIONS FOR RECOVERY WELLS, MONITORING WELLS, AND INJECTION WELLS

LENOX CHINA, POMONA, NEW JERSEY

FIGURE 7

APPENDIX A

Lithologic Logs
Well Construction Logs

GERAGHTY & MILLER, INC.

SAMPLE/CORE LOG

BORING/WELL: 11 PROJECT NO: Lenox, Inc. NY0627TC01 PAGE: 1 of 1

SITE LOCATION: Pomona, New Jersey DRILLING STARTED: 6/13/88 DRILLING COMPLETED: 6/13/88

TOTAL DEPTH DRILLED: 62 feet HOLE DIAMETER: 6 inches TYPE OF SAMPLE/ CORING DEVICE: Split Barrel Core

LENGTH & DIAMETER OF CORING DEVICE: 2 feet/1 1/2 inches SAMPLING INTERVAL: 5 feet

LAND-SURFACE ELEVATION: ( ) SURVEYED ( ) ESTIMATED DATUM:

DRILLING FLUID USED: Bentonite and Water Slurry DRILLING METHOD: Hydraulic (Mud) Rotary

DRILLING CONTRACTOR: Absecon Electric Motor Works DRILLER: J. Pruchnicki HELPER: D. Pruchnicki

PREPARED BY: B. Blum HAMMER WEIGHT: HAMMER DROP:

SAMPLE DEPTH (FT BELOW LAND SURFACE)		CORE RECVRY (FT)	BLOW COUNTS PER 6 INCHES	SAMPLE/CORE DESCRIPTION
FROM	TO			
5	7	0.5	Pushed	Sand, fine with 20% silt and clay, tan to white; poorly sorted.
10	12	1.0	Pushed	Sand, fine to coarse, with silt (10%) and gravel (20%) tan to white; poorly sorted.
15	17	1.0	Pushed	Sand, medium to coarse, with gravel (20%) and trace silt, tan to white.
20	22	1.0	Pushed	Sand, fine to medium, tan to white; well sorted.
25	27	1.0	Pushed	Sand, medium with some gravel, tan to white; well sorted.
30	32	1.0	Pushed	Sand coarse with gravel (30%) and silt tan to white; poorly sorted.
35	37	1.0	Pushed	Sand, fine, with silt (15%) tan to white; well sorted.
40	42	1.0	Pushed	Same as above.
45	47	1.0	Pushed	Same as above (pebbles in backwash).
50	52	1.0	Pushed	Same as above.
55	57	1.0	Pushed	Same as above.
60	62	1.0	Pushed	Same as above.

GERAGHTY & MILLER, INC.

SAMPLE/CORE LOG

BORING/WELL: 12D PROJECT NO: Lenox, Inc. NY0627TC01 PAGE: 1 of 2

SITE LOCATION: Pomona, New Jersey DRILLING STARTED: 6/15/88 DRILLING COMPLETED: 6/17/88

TOTAL DEPTH DRILLED: 92 feet HOLE DIAMETER: 6 inches TYPE OF SAMPLE/ CORING DEVICE: Split Barrel Core

LENGTH & DIAMETER OF CORING DEVICE: 2 feet/1 1/2 inches SAMPLING INTERVAL: 5 feet

LAND-SURFACE ELEVATION: ( ) SURVEYED ( ) ESTIMATED DATUM:

DRILLING FLUID USED: Bentonite and Water Slurry DRILLING METHOD: Hydraulic (Mud) Rotary

DRILLING CONTRACTOR: Absecon Electric Motor Works DRILLER: J. Pruchnicki HELPER: D. Pruchnicki

PREPARED BY: B. Blum HAMMER WEIGHT: HAMMER DROP:

SAMPLE DEPTH (FT BELOW LAND SURFACE)		CORE RECVRY (FT)	BLOW COUNTS PER 6 INCHES	SAMPLE/CORE DESCRIPTION
FROM	TO			
5	7	1.0	Pushed	Sand, medium, tan to white with gravel and pebbles
				(25%).
10	12	0.5	Pushed	Same as above with 40% gravel and pebbles.
15	17	---	Pushed	All backwash gravel and pebbles. Flume sample shows
				sand, medium to coarse with 50% gravel.
20	22	---	Pushed	No recovery - backwash gravel was blocking shoe of core
				barrel.
25	27	---	Pushed	Formation is taking water. Recovery blocked by pebble.
				Flume shows material same as above.
30	32	1.0	Pushed	Sand, fine to medium with 5% silt and 10% gravel.
				Horizontally stratified. Tan to white.
35	37	1.0	Pushed	Sand, medium to coarse with gravel (25%) white to tan;
				trace silt.
40	42	0.5	Pushed	Same as above.
45	47	0.5	Pushed	Same as above.
50	52	0.25	Pushed	Sand, fine to coarse with 40% gravel. Silt and clay
				(10%); poorly sorted.
55	57	1.0	Pushed	Sand, fine to medium with 25% gravel. Tan to white.
60	62	1.0	Pushed	Sand, fine to medium with 25% gravel tan to white
				grading into fine to medium sand rusty orange.
				Obvious color contrast. Pieces of clay in flume
				sample 62 - 65.

GERAGHTY & MILLER, INC.

SAMPLE/CORE LOG (Cont.d)

BORING/WELL: 12D PREPARED BY: B. Blum PAGE: 2 of 2

SAMPLE DEPTH (FT BELOW LAND SURFACE)		CORE RECVRY (FT)	BLOW COUNTS PER 6 INCHES	SAMPLE/CORE DESCRIPTION
FROM	TO			
65	67	1.0	Pushed	Sand, fine to medium with 30 - 40 percent silt and clay,
				orange, horizontally stratified.
70	72	2.0	Pushed	Circulation pressure jumped from 25 to 300 psi at 70
				feet. Clay, gray with tan and orange streaks. Some
				silt and trace very fine sand. Dense and cohesive.
				Flume 72 - 75 feet chunks of clay, gray.
6/17/88				
75	77	---	Pushed	No recovery. Circulation pressure indicates clay lense
				is 5 feet thick and is not present below 75 feet.
				Flume 77 - 80 feet shows and medium sand, rusty
				orange.
80	82	1.0	Pushed	Sand, fine to medium, rusty orange, well sorted.
85	87	0.5	Pushed	Sand, fine, tan to white.
90	92	0.5	Pushed	Sand, very fine with silt (50%). Clay lense (0.2 feet)
				at 90 feet.

GERAGHTY & MILLER, INC.

SAMPLE/CORE LOG

BORING/WELL: 13 PROJECT NO: Lenox, Inc. NY0627TC01 PAGE: 1 of 1

SITE LOCATION: Pomona, New Jersey DRILLING STARTED: 6/20/88 DRILLING COMPLETED: 6/20/88

TOTAL DEPTH DRILLED: 62 feet HOLE DIAMETER: 6 inches TYPE OF SAMPLE/ CORING DEVICE: Split Barrel Core

LENGTH & DIAMETER OF CORING DEVICE: 2 feet/1 1/2 inches SAMPLING INTERVAL: 5 feet

LAND-SURFACE ELEVATION: ( ) SURVEYED ( ) ESTIMATED DATUM:

DRILLING FLUID USED: Bentonite and Water Slurry DRILLING METHOD: Hydraulic (Mud) Rotary

DRILLING CONTRACTOR: Absecon Electric Motor Works DRILLER: J. Pruchnicki HELPER: D. Pruchnicki

PREPARED BY: B. Blum HAMMER WEIGHT: HAMMER DROP:

SAMPLE DEPTH (FT BELOW LAND SURFACE)		CORE RECVRY (FT)	BLOW COUNTS PER 6 INCHES	SAMPLE/CORE DESCRIPTION
FROM	TO			
5	7	0.5	Pushed	Sand, fine with 25% silt, tan.
10	12	---	Pushed	Backwash of pebbles.
15	17	0.5	Pushed	Sand, coarse with gravel and pebbles (50%).
20	22	---	Pushed	No recovery. Flume sample consists of sand, medium to
				coarse with 50% gravel and pebbles.
25	27	0.5	Pushed	Gravel and pebbles 50% mixed with sand, medium to
				coarse, tan.
30	32	0.5	Pushed	Same as above.
35	37	---	Pushed	No recovery. Flume shows same as above.
40	42	0.5	Pushed	Sand, fine, white to tan; well sorted.
45	47	---	Pushed	No recovery. Backwash gravel and pebbles with sand,
				coarse.
50	55	0.5	Pushed	Sand, medium to coarse with gravel and pebbles (50%).
55	57	0.5	Pushed	Same as above.
60	62	0.5	Pushed	Sand, medium, white; with gravel.

GERAGHTY & MILLER, INC.

SAMPLE/CORE LOG

BORING/WELL: 14D PROJECT NO: Lenox, Inc. NY0627TC01 PAGE: 1 of 2

SITE LOCATION: Pomona, New Jersey DRILLING STARTED: 6/21/88 DRILLING COMPLETED: 6/21/88

TOTAL DEPTH DRILLED: 88 feet HOLE DIAMETER: 6 inches TYPE OF SAMPLE/ CORING DEVICE: Split Barrel Core

LENGTH & DIAMETER OF CORING DEVICE: 2 feet/1 1/2 inches SAMPLING INTERVAL: 5 feet

LAND-SURFACE ELEVATION: ( ) SURVEYED ( ) ESTIMATED DATUM:

DRILLING FLUID USED: Bentonite and Water Slurry DRILLING METHOD: Hydraulic (Mud) Rotary

DRILLING CONTRACTOR: Absecon Electric Motor Works DRILLER: J. Pruchnicki HELPER: D. Pruchnicki

PREPARED BY: B. Blum HAMMER WEIGHT: HAMMER DROP:

SAMPLE DEPTH (FT BELOW LAND SURFACE)		CORE RECVRY (FT)	BLOW COUNTS PER 6 INCHES	SAMPLE/CORE DESCRIPTION
FROM	TO			
5	7	2.0	Pushed	Silt, tan with orange streaks (silt in flume down to 8
				feet).
10	12	1.0	Pushed	Sand, coarse with gravel, well sorted.
15	17	0.5	Pushed	Large pebble blocked shoe of core barrel. Sand, coarse
				with gravel (50%).
20	22	---	Pushed	No recovery, pebbles blocked core barrel. Sand, coarse
				and gravel in flume.
25	27	---	Pushed	No recovery, pebbles blocked core barrel. Same as above
				in flume.
30	32	---	Pushed	Same as above.
35	37	1.0	Pushed	Sand, fine, white, well sorted.
40	42	1.0	Pushed	Sand, medium to coarse, tan to white.
45	47	1.0	Pushed	Same as above.
50	52	1.0	Pushed	Same as above.
55	57	1.5	Pushed	Sand, medium with 20% silt tan and gravel.
60	62	1.5	Pushed	Sand, fine with 25% silt, white. Flume and mud changed
				color to a more rusty yellow at 65 feet.
65	67	2.0	Pushed	Clay, (65 - 65.75 feet) orange with silt and very fine
				sand grading into a silt and very fine sand mixture,
				orange.
70	72	2.0	Pushed	Sand, very fine to fine, silt, and clay horizontally
				stratified in lenses 1/4 inch to 2 inches. Rusty
				orange and compact.

GERAGHTY & MILLER, INC.

SAMPLE/CORE LOG (Cont.d)

BORING/WELL: 14D PREPARED BY: B. Blum

SAMPLE DEPTH (FT BELOW LAND SURFACE)		CORE RECVRY (FT)	BLOW COUNTS PER 6 INCHES	SAMPLE/CORE DESCRIPTION
FROM	TO			
75	77	---	Pushed	Down hole pressure was high at 73 feet (possible clay).
				Then lower (sand) at 73.5 to 75 feet. No recovery in
				spoon.
80	82	0.25	Pushed	Sand, fine to very fine, with 15% silt. Orange.
85	87	---	Pushed	No recovery. Flume shows same as above.

GERAGHTY & MILLER, INC.

SAMPLE/CORE LOG

BORING/WELL: 15 PROJECT NO: Lenox, Inc. NY0627TC01 PAGE: 1 of 1

SITE LOCATION: Pomona, New Jersey DRILLING STARTED: 6/23/88 DRILLING COMPLETED: 6/23/88

TOTAL DEPTH DRILLED: 21 feet HOLE DIAMETER: 6 inches TYPE OF SAMPLE/ CORING DEVICE: Cuttings off of Auger Flytes

LENGTH & DIAMETER OF CORING DEVICE: SAMPLING INTERVAL: 5 feet

LAND-SURFACE ELEVATION: ( ) SURVEYED ( ) ESTIMATED DATUM:

DRILLING FLUID USED: Bentonite and Water Slurry DRILLING METHOD: Hollow Stem Auger

DRILLING CONTRACTOR: Absecon Electric Motor Works DRILLER: J. Pruchnicki HELPER: D. Pruchnicki

PREPARED BY: B. Blum HAMMER WEIGHT: HAMMER DROP:

SAMPLE DEPTH (FT BELOW LAND SURFACE)		CORE RECVRY (FT)	BLOW COUNTS PER 6 INCHES	SAMPLE/CORE DESCRIPTION
FROM	TO			
0	5	---		Top 0.25 feet is aspalt on top of graded sand, medium,
				light brown.
5	10	---		Sand, fine to medium, tan, well sorted, moist.
10	15	---		Sand, fine, tan with 15 - 20 percent silt.
15	20	---		Same as above.

GERAGHTY & MILLER, INC.

SAMPLE/CORE LOG

WELL: RW-1 PROJECT NO: NY0627TC01 PAGE: 1 of 1

SITE LOCATION: LENOX, INC. Pomona, New Jersey DRILLING STARTED: 9/19/88 DRILLING COMPLETED: (Pilot Hole) 9/19/88

TOTAL DEPTH DRILLED: 50 Ft HOLE DIAMETER: 6 In. TYPE OF SAMPLE/ CORING DEVICE: Split Barrel Core

LENGTH & DIAMETER OF CORING DEVICE: 1.5 Ft by 2 In. SAMPLING INTERVAL: 5 Ft

LAND-SURFACE ELEVATION: ( ) SURVEYED ( ) ESTIMATED DATUM:

DRILLING FLUID USED: Polymer Free Bentonite and Water DRILLING METHOD: Hydraulic (Mud) Rotary

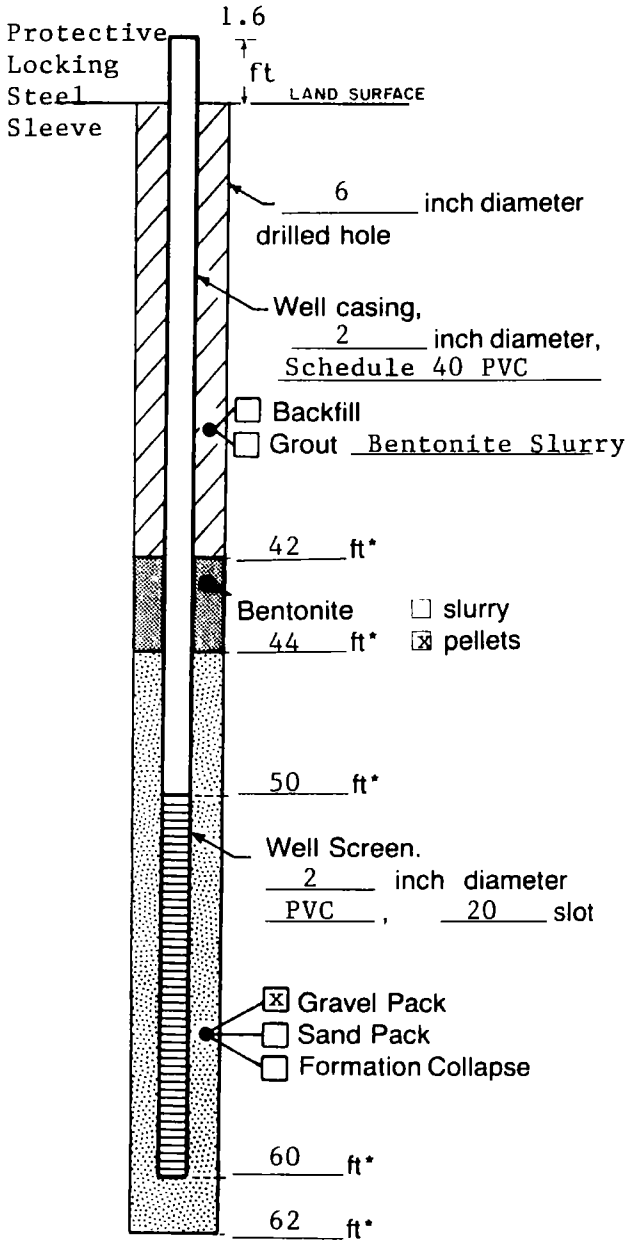
DRILLING CONTRACTOR: Absecon Electric Works, Inc. DRILLER: J. Pruchnicki HELPER: D. Pruchnicki

PREPARED BY: Brian A. Blum HAMMER WEIGHT: - HAMMER DROP: -

SAMPLE DEPTH (FT BELOW LAND SURFACE)		CORE RECVRY (FT)	BLOW COUNTS PER 6 INCHES	SAMPLE/CORE DESCRIPTION
FROM	TO			
0	5	-	-	Flume shows evidence of fine-grained material (silt).
5	6.5	0.7	Pushed	Silt, gray with orange streaks. Sand, fine (25%) and
				clay (25%).
				At approximately 9 ft, rods bounce indicating sand in
				formation increasing.
10	11.5	1.0	Pushed	Silt, gray with clay and sand, fine. A few pebbles
				lodged into shoe of core barrel.
15	16.5	0.5	Pushed	Sand, medium to coarse with gravel (25%) white to tan.
20	21.5	0.5	Pushed	Sand, medium, well sorted. Pebble back wash in core
				barrel, tan to white.
25	26.5	0.5	Pushed	Same as above.
30	31.5	0.5	Pushed	Sand, fine with rusty orange streaks; backwash pebbles
				are still present.
35	36.5	0.5	Pushed	Sand, very fine, well sorted, tan.
40	41.5	0.75	Pushed	Sand, medium, tan, well sorted, some gravel (10%)
45	36.5	0.5	Pushed	Same as above.
50	51.5	0.75	Pushed	Sand, fine to medium, light gray, some gravel.

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc./NY0627TC01 Well 11

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. 36-10216 4

Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 6/13/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite and Water Slurry

Development Technique(s) and Date(s)
Surging with Compressed Air on 6/13/88

Fluid Loss During Drilling 500 gallons

Water Removed During Development 500 gallons

Static Depth to Water 10.00 - 2.91 = 7.09 on 6/15/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 10 gpm Date _____

Specific Capacity _____ gpm/ft

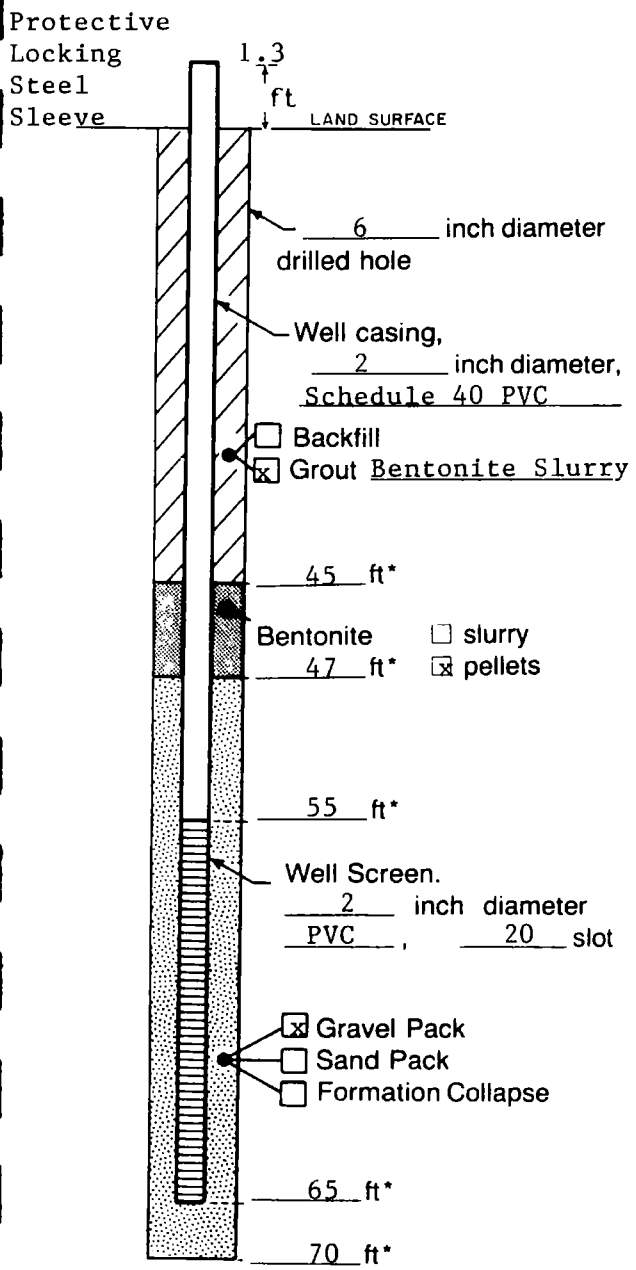
Well Purpose Monitoring

Remarks

Prepared by B. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc./NY0627TC01 Well 12S

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. 36-10214 8

Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 6/15/88

Drilling Method Hydraulic (Mud)Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite and Water Slurry

Development Technique(s) and Date(s)
Surging with Compressed Air on 6/15/88

Fluid Loss During Drilling 500 gallons

Water Removed During Development 500 gallons

Static Depth to Water 8.00 - 1.66 = 6.34 on 6/15/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 10 gpm Date _____

Specific Capacity _____ gpm/ft

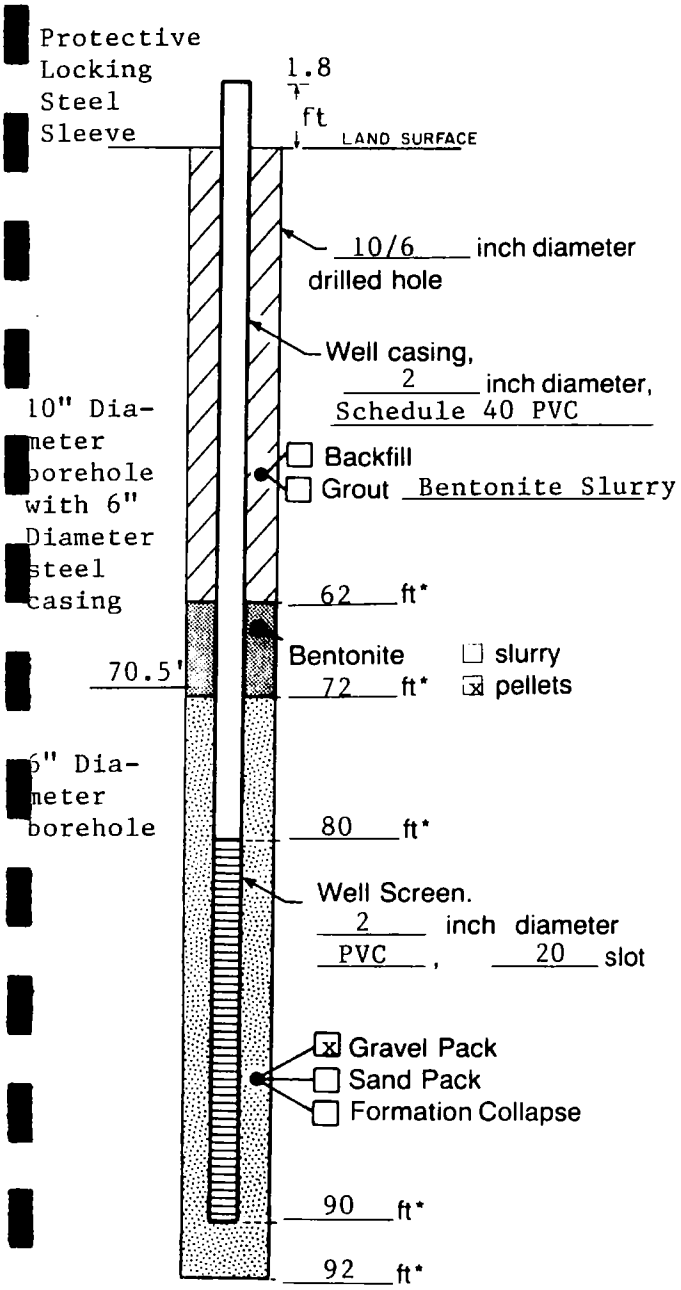
Well Purpose Monitoring

Remarks

Prepared by B. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc./NY0627TC01 Well 12D

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. 36-10218 8

Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 6/16-17/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite and Water Slurry

Development Technique(s) and Date(s)
Surging with Compressed Air on 6/17/88

Fluid Loss During Drilling 500 gallons

Water Removed During Development 500 gallons

Static Depth to Water 9.00 - 2.06 = 6.94 on 6/20/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 10 gpm Date _____

Specific Capacity _____ gpm/ft

Well Purpose Monitoring Below Confining Unit

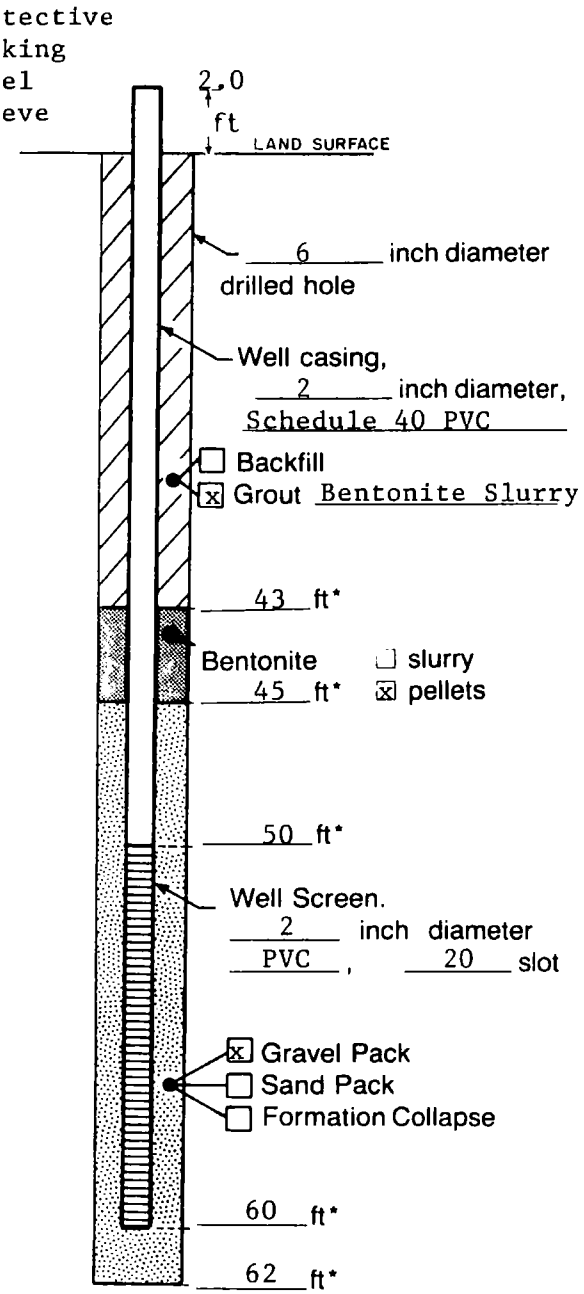
Remarks A 6-inch diameter steel casing was seated into the clay at 70 feet below land surface. The annular space between the 10-inch diameter borehole and 6-inch diameter casing was slurried using tremie pipe. A 6-inch diameter borehole was subsequently drilled to 92 feet (through the 6-inch diameter casing) in which a 2-inch well was placed.

Prepared by B. Blum

Southprint 87-1776

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc./NY0627TC01 Well 13

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. 36-10213 0

Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 6/20/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite and Water Slurry

Development Technique(s) and Date(s)
Surging with Compressed Air on 6/20/88

Fluid Loss During Drilling 300 gallons

Water Removed During Development 300 gallons

Static Depth to Water 10.00 - 1.50 = 8.50 on 6/21/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 10 gpm Date _____

Specific Capacity _____ gpm/ft

Well Purpose Monitoring

Remarks

Prepared by B. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)

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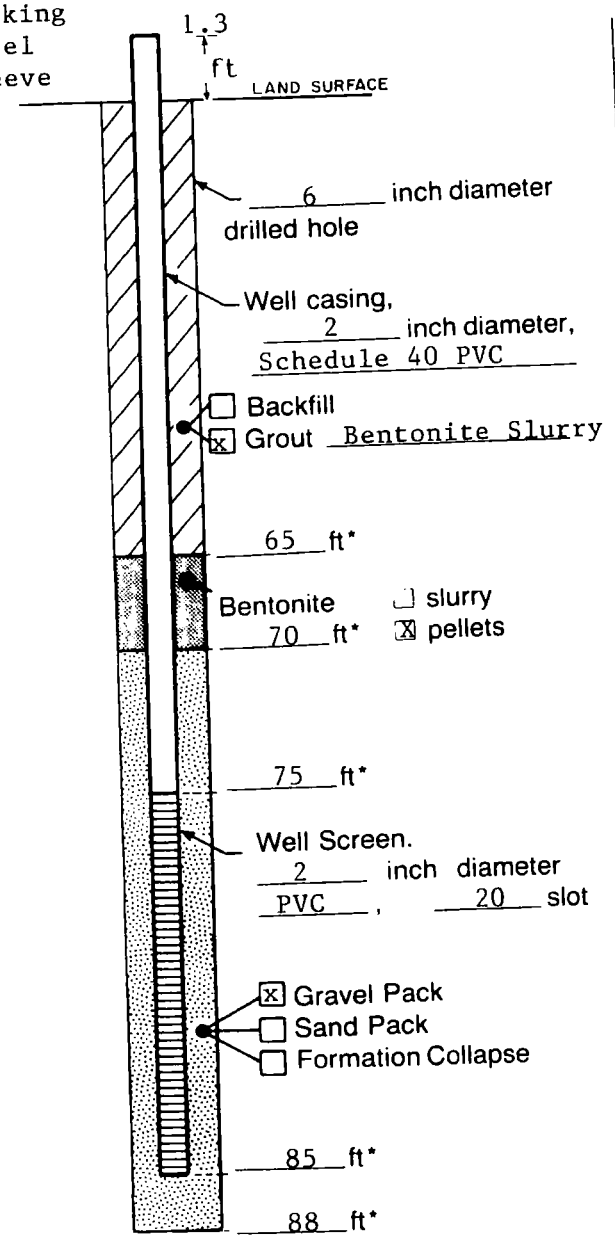


Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc./NY0627TC01 Well 14D

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. 36-10219 6

Land-Surface Elevation

and Datum _____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 6/21/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite and Water Slurry

Development Technique(s) and Date(s)

Surging with Compressed Air on 6/22/88

Fluid Loss During Drilling 500 gallons

Water Removed During Development 500 gallons

Static Depth to Water 7.78 on 6/23/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 10 gpm Date _____

Specific Capacity _____ gpm/ft

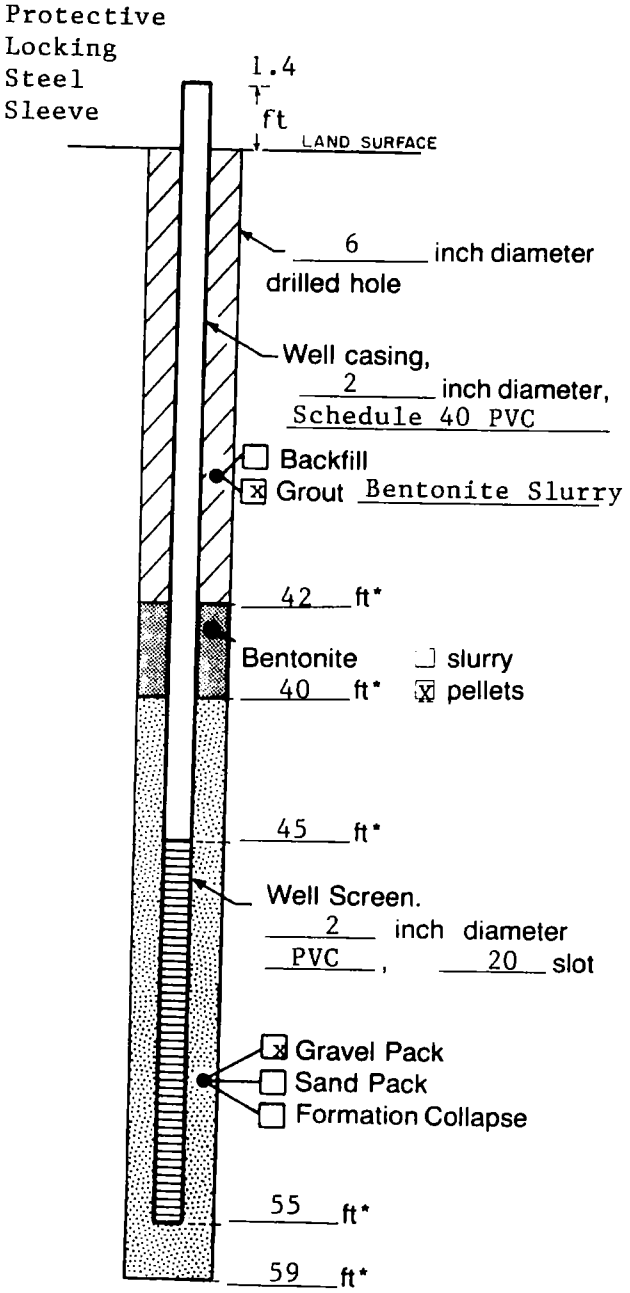
Well Purpose Monitoring

Remarks

Prepared by B. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc./NY0627TC01 Well 14S

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. 36-10215 6

Land-Surface Elevation and Datum _____ feet ☐ Surveyed ☐ Estimated

Installation Date(s) 6/22/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite and Water Slurry

Development Technique(s) and Date(s)
Surging with Compressed Air on 6/22/88

Fluid Loss During Drilling 500 gallons

Water Removed During Development 500 gallons

Static Depth to Water 7.65 on 6/23/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 10 gpm Date _____

Specific Capacity _____ gpm/ft

Well Purpose Monitoring

Remarks

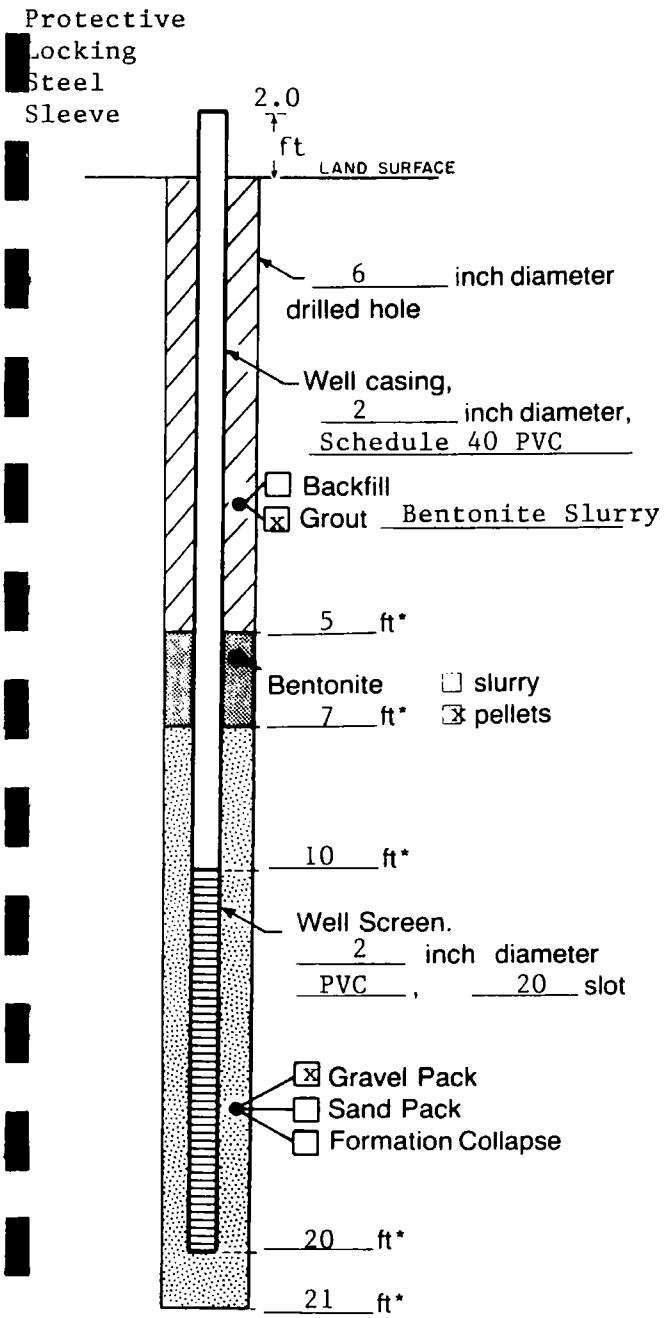
Prepared by B. Blum

G&M Form 05 5-87

Southprint 87-1776

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG
(UNCONSOLIDATED)



Measuring Point is
Top of Well Casing
Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc./NY0627TC01 Well 15

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. 36-10217 2

Land-Surface Elevation

and Datum _____ feet ☐ Surveyed

_____ ☐ Estimated

Installation Date(s) 6/23/88

Drilling Method Hollow Stem Auger

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite and Water Slurry

Development Technique(s) and Date(s)

Surging with Compressed Air on 6/23/88

Fluid Loss During Drilling None gallons

Water Removed During Development 100 gallons

Static Depth to Water _____ feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 5 gpm Date _____

Specific Capacity _____ gpm/ft

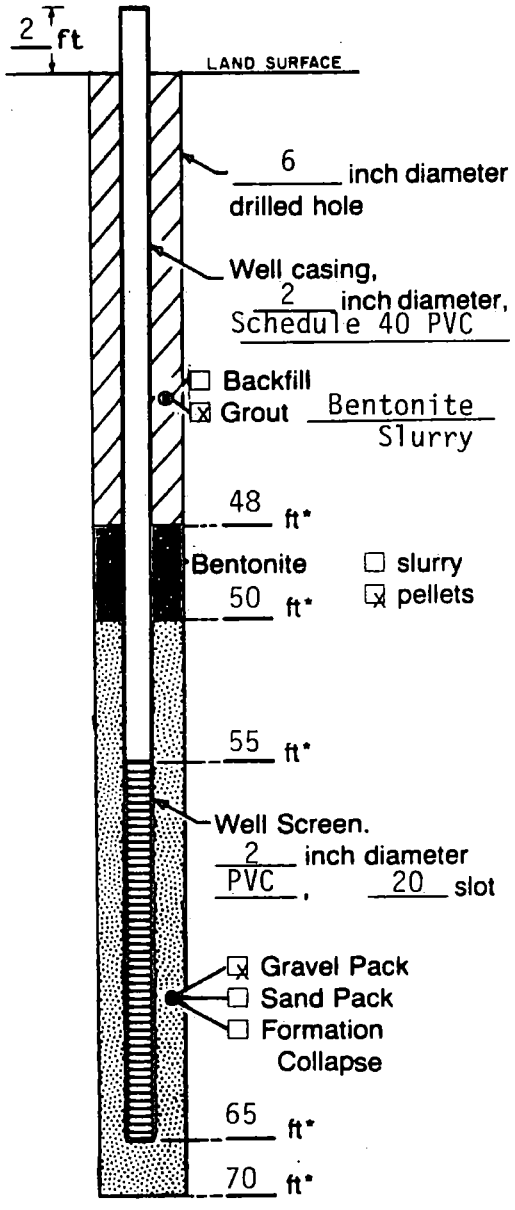
Well Purpose Monitoring

Remarks

Prepared by B. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc. NY0627TC01 Well 16

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. _____

Land-Surface Elevation and Datum _____ feet ☐ surveyed ☐ estimated

Installation Dates(s) 9/20/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite and Water Slurry

Development Techniques(s) and Date(s)
Surging with compressed air on 9/20/88.

Fluid Loss During Drilling Approximately 500 gallons

Water Removed During Development Approximately 500 gallons

Static Depth to Water 8.89 on 9/22/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield at least 10 gpm Date _____

Specific Capacity _____ gpm/ft

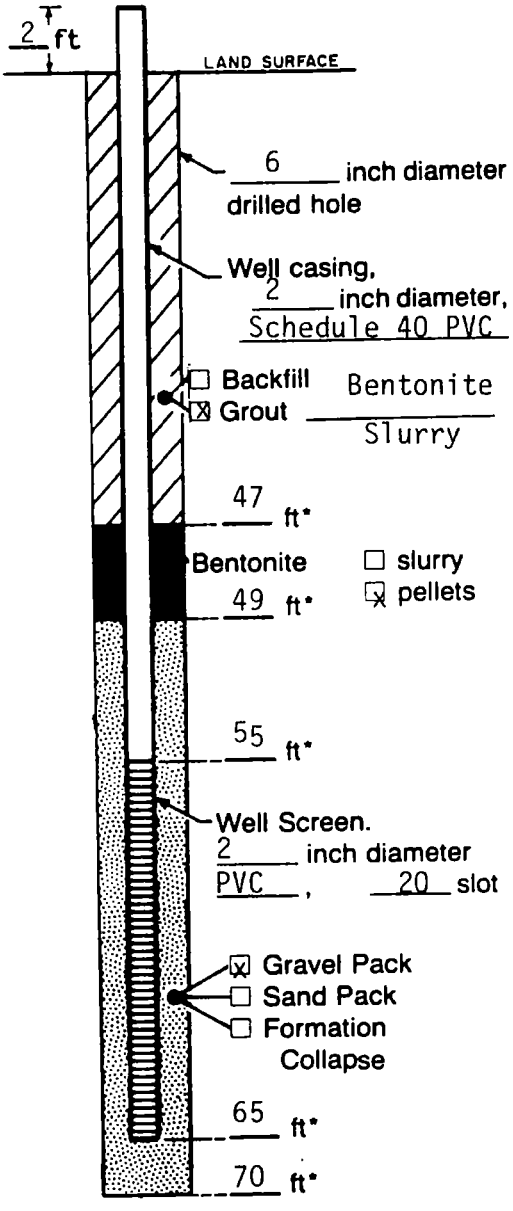
Well Purpose Monitoring

Remarks

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Lenox, Inc.

Project NY0627TC01 Well 17

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. _____

Land-Surface Elevation and Datum _____ feet ☐ surveyed ☐ estimated

Installation Dates(s) 9/21/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite and Water Slurry

Development Techniques(s) and Date(s)

~~Surging with compressed~~ air on 9/21~~/88~~.

Fluid Loss During Drilling approximately 500 gallons

Water Removed During Development approximately 500 gallons

Static Depth to Water 8.85 on 9/22/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield at least 10 gpm Date _____

Specific Capacity _____ gpm/ft

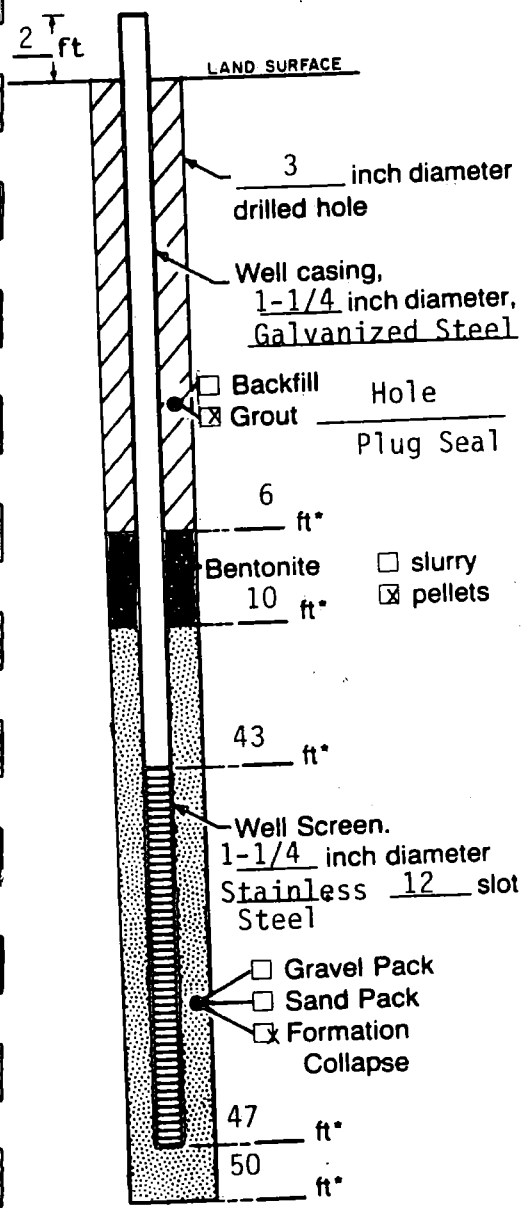
Well Purpose _____

Remarks _____

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc. NY0627TC01 Well P18

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No.

Land-Surface Elevation and Datum _____ feet ☐ surveyed ☐ estimated

Installation Dates(s) 9/21/88

Drilling Method Auger (Solid Stem)

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid None

Development Techniques(s) and Date(s)
Pumped and backwashed with a centrifugal pump on 9/22/88.

Fluid Loss During Drilling None gallons

Water Removed During Development 500 gallons

Static Depth to Water 9.89 on 9/23/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 25 gpm Date _____

Specific Capacity _____ gpm/ft

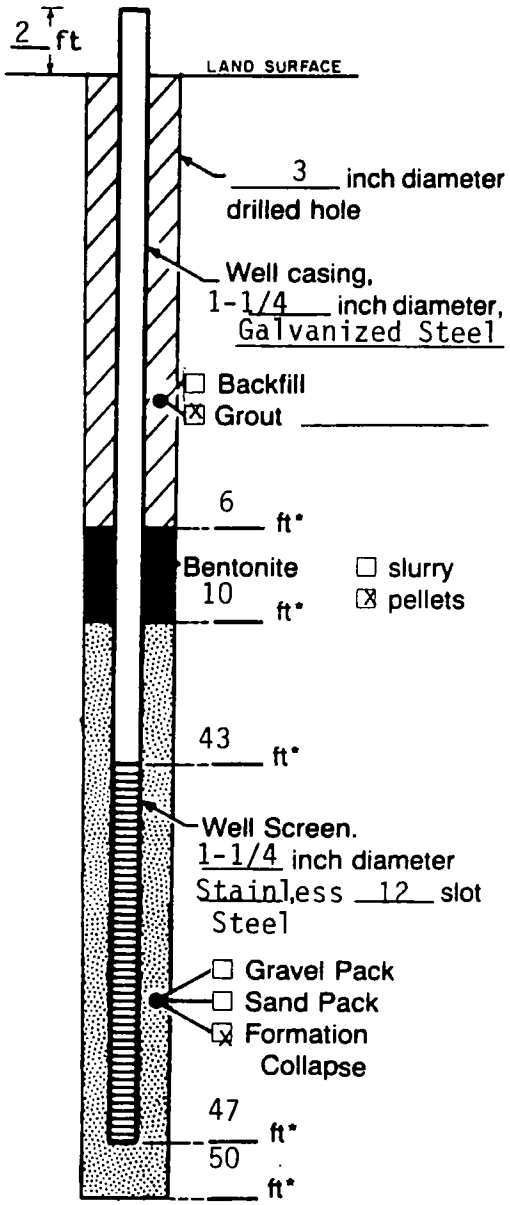
Well Purpose Monitoring

Remarks 1-1/4 inch diameter piezometer installed. The screen is slotted for 3 feet. The drive point and coupler for the riser pipe are 1 foot.

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc. NY0627TC01 Well P 19

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. _____

Land-Surface Elevation and Datum _____ feet ☐ surveyed ☐ estimated

Installation Dates(s) 9/21/88

Drilling Method Auger (Solid Stem)

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid _____

Development Techniques(s) and Date(s)
Pumped and backwashed with a centrifugal pump on 9/22/88.

Fluid Loss During Drilling None gallons

Water Removed During Development 500 gallons

Static Depth to Water 10.55 on 9/23/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 25 gpm Date _____

Specific Capacity _____ gpm/ft

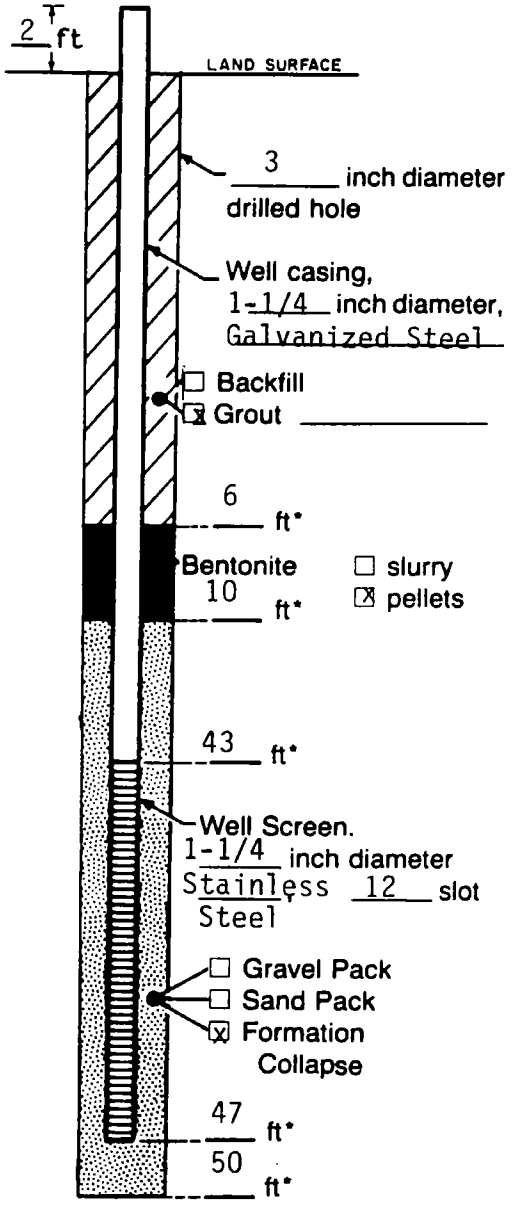
Well Purpose Monitoring

Remarks 1-1/4 inch diameter piezometer installed. The screen is slotted for 3 feet. The drive point and coupler for the riser pipe are 1 foot.

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Lenox, Inc.

Project NY0627TC01 Well P 20

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. _____

Land-Surface Elevation

and Datum _____ feet ☐ surveyed

_____ ☐ estimated

Installation Dates(s) 9/21/88

Drilling Method Auger (Solid Stem)

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid None

Development Techniques(s) and Date(s)

Pumped and backwashed with a centrifugal pump on 9/22/88.

Fluid Loss During Drilling None gallons

Water Removed During Development 500 gallons

Static Depth to Water 10.53 on 9/23/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 25 gpm Date _____

Specific Capacity _____ gpm/ft

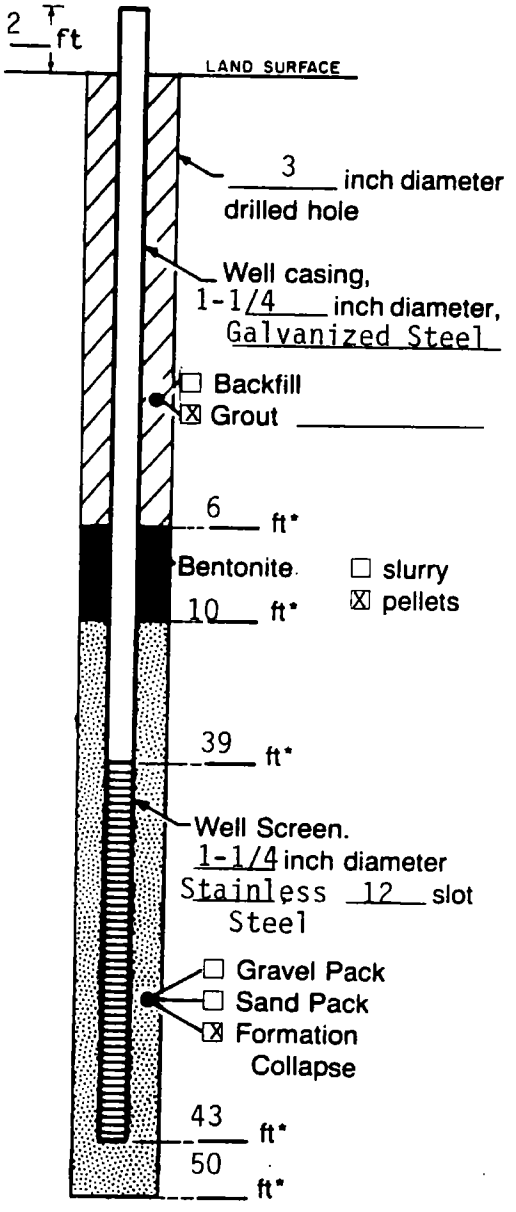
Well Purpose Monitoring

Remarks 1-1/4 inch diameter piezometer installed. The screen is slotted for 3 feet. The drive point and coupler for the riser pipe are 1 foot.

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc. NY0627TC01 Well P 21

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. _____

Land-Surface Elevation and Datum _____ feet ☐ surveyed ☐ estimated

Installation Dates(s) 9/22/88

Drilling Method Auger (Solid Stem)

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid None

Development Techniques(s) and Date(s)
Pumped and backwashed with a centrifugal pump on 9/22/88.

Fluid Loss During Drilling None gallons

Water Removed During Development 500 gallons

Static Depth to Water 10.99 on 9/23/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 25 gpm Date _____

Specific Capacity _____ gpm/ft

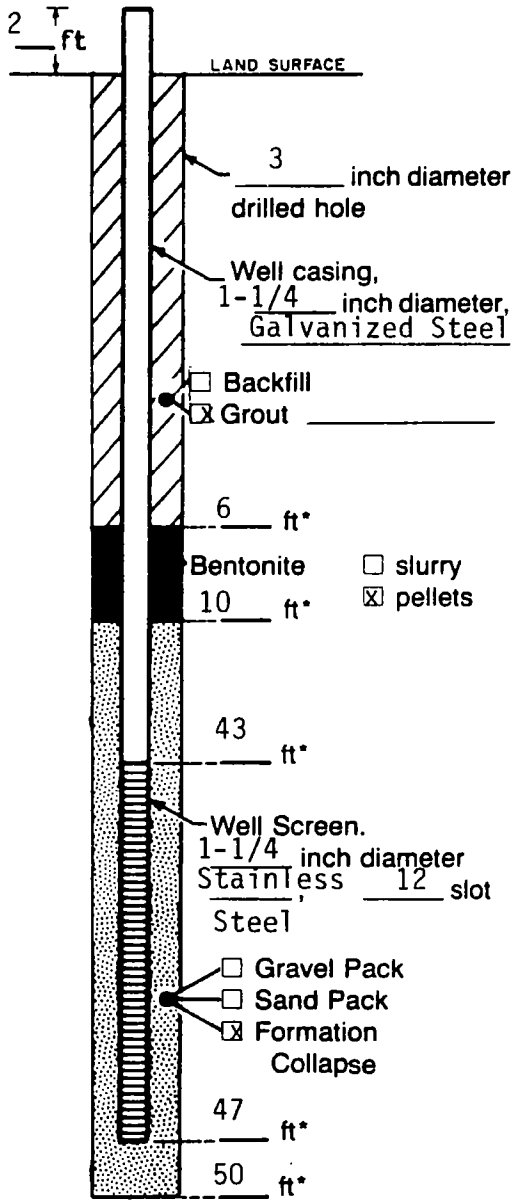
Well Purpose Monitoring

Remarks 1-1/4 inch diameter piezometer installed. The screen is slotted for 3 feet. The drive point and coupler for the riser pipe are 1 foot.

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.
Ground-Water Consultants

WELL CONSTRUCTION LOG



Measuring Point is Top of Well Casing Unless Otherwise Noted.

*Depth Below Land Surface

Project Lenox, Inc. NY0627TC01 Well P 22

Town/City Galloway Township/Pomona

County Atlantic State New Jersey

Permit No. _____

Land-Surface Elevation and Datum _____ feet ☐ surveyed ☐ estimated

Installation Dates(s) 9/22/88

Drilling Method Auger (Solid Stem)

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid None

Development Techniques(s) and Date(s)
Pumped and backwashed with a centrifugal pump on 9/22/88.

Fluid Loss During Drilling None gallons

Water Removed During Development 500 gallons

Static Depth to Water 9.48 on 9/23/88 feet below M.P.

Pumping Depth to Water _____ feet below M.P.

Pumping Duration 1 hours

Yield 25 gpm Date _____

Specific Capacity _____ gpm/ft

Well Purpose Monitoring

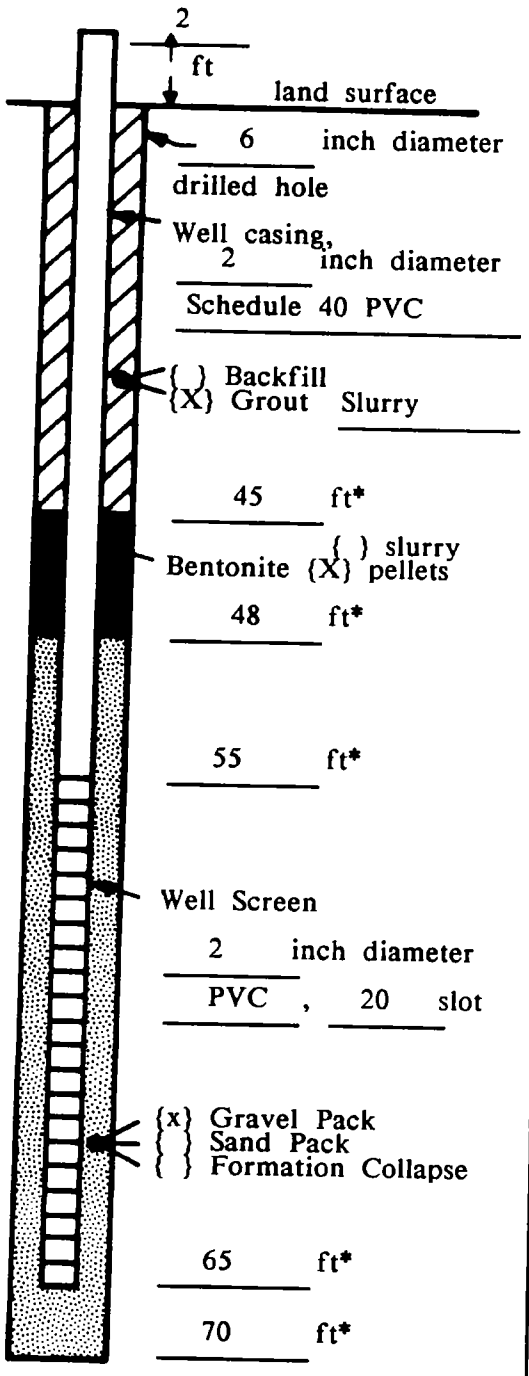
Remarks 1-1/4 inch diameter piezometer installed. The screen is slotted for 3 feet. The drive point and coupler for the riser pipe are 1 foot.

Prepared by Brian A. Blum

GERAGHTY & MILLER, INC.

WELL CONSTRUCTION LOG

(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

* Depth Below Land Surface

Project Lenox, Inc. (NY08501) Well 23

Town/City Galloway Township, Pomona

County Atlantic State New Jersey

Permit No.

Land-Surface Elevation and Datum feet { } Surveyed { } Estimated

Installation Date(s) 10/13/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite with Water Slurry

Development Technique(s) and Date(s)
- Surging with compressed air on 10/13/88.
- Surging and backwash with a centrifugal pump on 10/14/88.

Fluid Loss During Drilling approx. 500 gallons

Water Removed During Development approx. 1,000 gallons

Static Depth to Water 8.56 feet below M.P.

Pumping Depth to Water feet below M.P.

Pumping Duration 1 hours

Yield 30 gpm Date

Specific Capacity gpm/ft

Well Purpose Monitoring

Fracture Zones

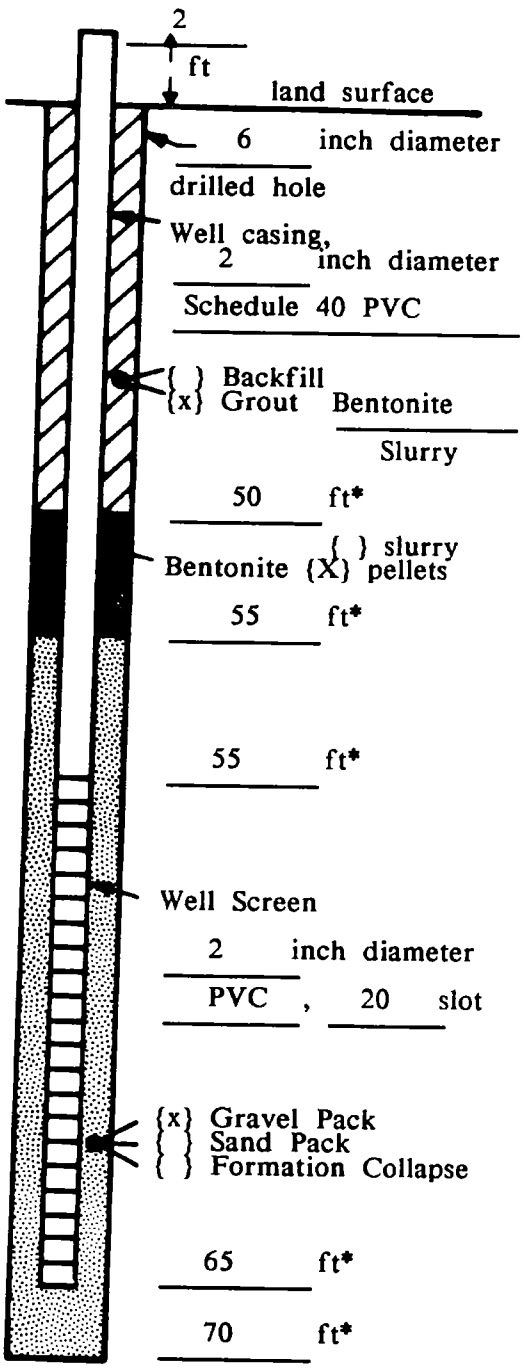
Remarks

Prepared by Brian Blum

GERAGHTY & MILLER, INC.

WELL CONSTRUCTION LOG

(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

* Depth Below Land Surface

Project Lenox, Inc. (NY08501) Well 24

Town/City Galloway Township, Pomona

County Atlantic State New Jersey

Permit No.

Land-Surface Elevation and Datum feet { } Surveyed { } Estimated

Installation Date(s) 10/13/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite with Water Slurry

Development Technique(s) and Date(s)
- Surging with compressed air on 10/13/88.
- Surging and backwash with a centrifugal pump on 10/14/88.

Fluid Loss During Drilling approx. 500 gallons

Water Removed During Development approx. 1,000 gallons

Static Depth to Water 9.89 feet below M.P.

Pumping Depth to Water feet below M.P.

Pumping Duration 1 hours

Yield 30 gpm Date

Specific Capacity gpm/ft

Well Purpose Monitoring

Fracture Zones

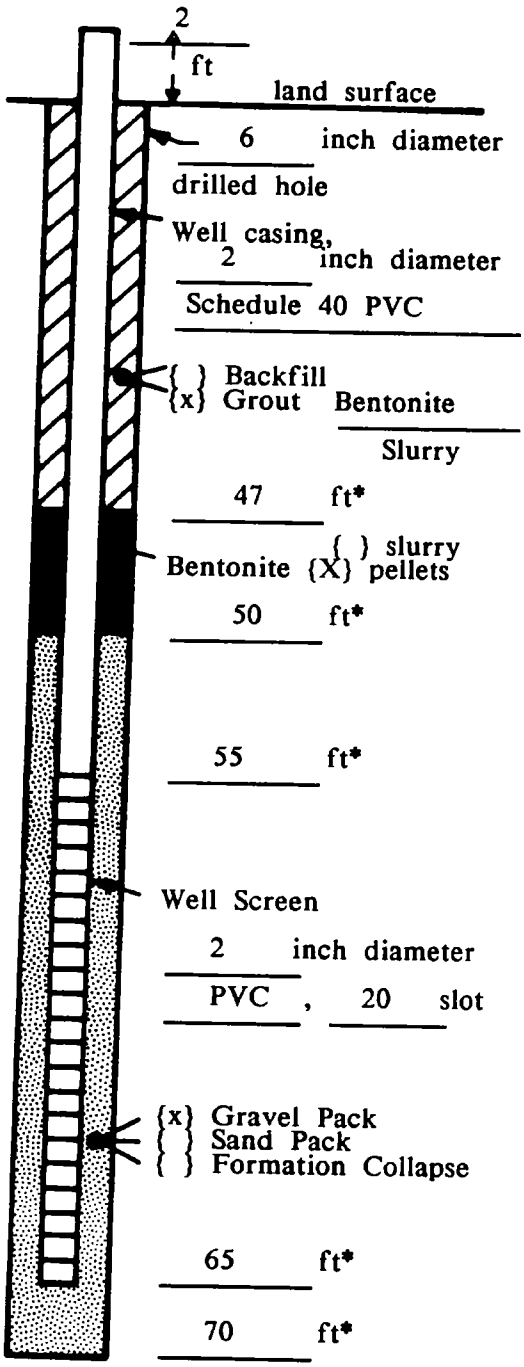
Remarks

Prepared by Brian Blum

GERAGHTY & MILLER, INC.

WELL CONSTRUCTION LOG

(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

* Depth Below Land Surface

Project Lenox, Inc. (NY08501) Well 25

Town/City Galloway Township, Pomona

County Atlantic State New Jersey

Permit No.

Land-Surface Elevation and Datum feet { } Surveyed { } Estimated

Installation Date(s) 10/13/88

Drilling Method Hydraulic (Mud) Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Bentonite with Water Slurry

Development Technique(s) and Date(s)
- Surging with compressed air on 10/13/88.
- Surging and backwash with a centrifugal pump on 10/14/88.

Fluid Loss During Drilling approx. 500 gallons

Water Removed During Development approx. 1,000 gallons

Static Depth to Water 9.00 feet below M.P.

Pumping Depth to Water feet below M.P.

Pumping Duration 1 hours

Yield 30 gpm Date

Specific Capacity gpm/ft

Well Purpose Monitoring

Fracture Zones

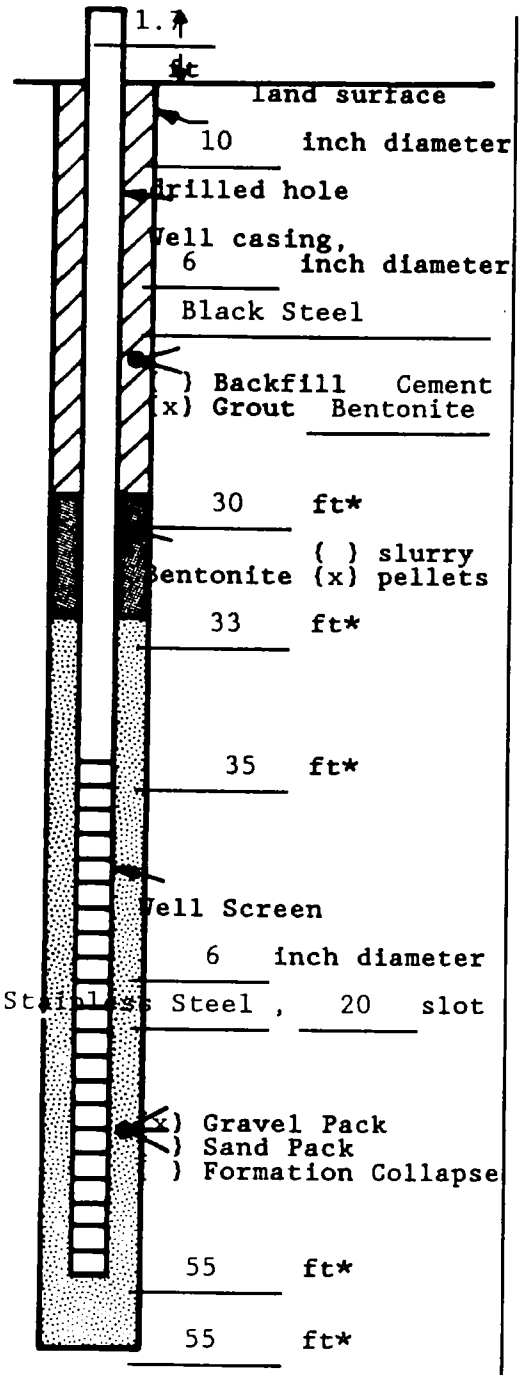
Remarks

Prepared by Brian Blum

GERAGHTY & MILLER, INC.

WELL CONSTRUCTION LOG

(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

* Depth Below Land Surface

Project Lenox, China Well RW-1

Town/City Pomona

County Atlantic State New Jersey

Permit No. 36-10833

Land-Surface Elevation and Datum _____ feet ( ) Surveyed ( ) Estimated

Installation Date(s) 11/29/88

Drilling Method Mud Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Water

Development Technique(s) and Date(s)
Pumping, surging and jetting with compressed air.

Fluid Loss During Drilling 1200 gallons

Water Removed During Development 37500 gallons

Static Depth to Water 9.1 feet below M.P.

Pumping Depth to Water 11 feet below M.P.

Pumping Duration 12½ hours

Yield 50 gpm Date 12/1/88

Specific Capacity 25 gpm/ft

Well Purpose Recovery

Fracture Zones

Remarks

Prepared by C. Schmidt, C. Gilroy

APPENDIX B

Description and Results of RW-1 Aquifer Test
December 6 to 8, 1988, Lenox China, Pomona, New Jersey

Originally submitted as Appendix A of the
Ground-Water Remediation Design Report, Lenox China Facility
Pomona, New Jersey.
Prepared by Eder Associates, March 1989

APPENDIX A

DESCRIPTION AND RESULTS OF RW-1 AQUIFER TEST DECEMBER 6 TO 8, 1988, LENOX CHINA, POMONA, NEW JERSEY

MARCH 1989

Geraghty & Miller, Inc.
Ground-Water Services
125 East Bethpage Road
Plainview, New York 11803

CONTENTS

TABLES

FIGURES

FIGURES (continued)

INTRODUCTION

During December 6 through 8, 1988, Geraghty & Miller, Inc. conducted a constant-rate aquifer pumping test using recovery well RW-1. The purpose of the test was to determine the optimal pumping rate to intercept the full width of a plume of trichloroethene (TCE) dissolved in ground water as determined from ground-water quality data collected from monitoring wells. Figure A1 shows the concentrations of TCE that have been detected at the monitoring wells. These data are also presented, along with historical data, in Table A1.

RW-1 was designed for use as a ground-water recovery well; it is located in the area with the highest measured concentrations of TCE and the screen coincides with the depth where contamination occurs as determined from prior field investigations. A well construction diagram is included as Figure A2. The movement of the TCE appears to be controlled by a slight downward hydraulic gradient of approximately 0.008 ft/ft; however, a clay layer at a depth of 60 ft appears to be continuous and prevent the migration of TCE beneath the clay.

METHODOLOGY OF TEST

RW-1 was temporarily equipped with a Model SP27-6 Grundfos 10 horsepower single phase 6-inch submersible pump. The well was them pumped steadily at the rate of 122 gallons per minute (gpm) for over 42 hours from noon on December 6 until 6:25 am on December 8. This rate was selected to stress the aquifer enough to quantify aquifer hydraulic coefficients and draw ground-water from piezometers 18 and 21 towards RW-1.

Prior to the test, a complete round of static water levels was taken for all of the site monitoring wells and piezometers. Water levels were measured throughout the test to collect the time-versus-drawdown data needed to analyze the aquifer test. The test was ended when the system approached steady-state conditions. Table A2 presents the static water levels, and the pumping water levels, and the calculated drawdowns after pumping for approximately 24 and 42 hours. The configurations of the water table under static conditions and after pumping for 24 and 42 hours are shown in Figures A3, A4, and A5. Table A3 presents the

drawdown data throughout the test at Piezometers 18, 19, and 20 and at the pumping well, RW-1.

Water levels in the pumping well and the observation wells were measured using several methods. A pressure transducer combined with the Enviro Labs EL-200/system 17 data logger was used for the pumping well (RW-1) and Piezometers 18, 19, and 20. An M-scope was used to check the water levels being monitored by the pressure transducers. Regular systematic rounds of water levels were measured in all other observation wells at the site with a steel tape and chalk.

The pumping discharge rate was measured periodically throughout the test using a circular orifice weir and manometer tube. The discharged water was piped into a sewer manhole on Lenox's property north of the manufacturing plant that ultimately discharges to the Atlantic County Utilities Authority treatment plant. This precluded the pumped water from artificially recharging the aquifer in the test area and adversely impacting the test.

WATER QUALITY OF RW-1

The concentration of trichloroethene (TCE) in RW-1 prior to pumping is included in Figure A1. The TCE concentrations fell into a narrow range of 800 to 1200 ug/L (Table A1). Piezometers 18, 19, 20, and 21 flank recovery Well RW-1 and serve to define the TCE plume width (Figure A1). The edge of the plume does not extend to Piezometers 18 and 21; therefore if pumping creates a flow from these Piezometers to RW-1, the width of the plume will be captured.

ANALYSIS OF AQUIFER TEST

To calculate the aquifer hydraulic coefficients of transmissivity and storativity, the time versus drawdown plots for Piezometers 18, 19, and 20 were analyzed using the Boulton method (Lohman 1979). The plots are included as Figures A6, A7, and A8. The Boulton delayed-yield technique was used because the screened intervals of Piezometers 18, 19, and 20 fall within the screen zone of Well RW-1, and the time versus drawdown plots revealed a delayed-yield response. The calculated transmissivities range from 56,000 to 70,000 gallons per day per foot

(gpd/ft). The average transmissivity value is 63,000 gpd/ft. The storativities range from 0.002 to 0.016; the average value is 0.010.

CAPTURE ZONE ANALYSIS

The drawdown data collected during the aquifer test were analyzed by two methods to determine what pumping rate would contain the width of the plume as delineated by piezometers 18 and 21. The first method described below was based on the drawdowns observed during the test and predicted the discharge rate that would produce the minimum size cone of depression required. The second method employed a Theis analysis to evaluate and corroborate the capture zone results obtained from the empirical data.

The first analysis (i.e., using the dynamic [pumping] water-level data) was based on the linear relationship between the pumping rate and the resulting drawdown. Under non-pumping conditions, ground water flow is oblique to RW-1, and the hydraulic gradient between Well RW-1 and Piezometers 18 and 21 is very flat, on the order of 0.0007 ft/ft. At the end of the aquifer test, a new water-table configuration was derived such that the direction of ground water flow was reoriented toward Well RW-1. The pumping hydraulic gradient toward RW-1 was measured at 0.007 ft/ft for flow from Piezometer 18 to 19, and 0.002 ft/ft for flow from Piezometer 20 to 21. These gradients far exceed the minimums required to capture the complete width of the plume. Applying the linear relationship which is assumed to exist between the pumpage rate and the resulting drawdown, a pumping rate of 33 gpm was calculated to produce the minimum necessary amount of drawdown to capture the plume width. Adding a safety factor of 50 percent, which is anticipated to accommodate temporary reduction in the capture zone as a result of heavy precipitation, a pumping rate of 50 gpm was calculated as the design criterion. As illustrated on Figure A9, reducing the aquifer test water-table slope by 41 percent, which represents a theoretical pumping rate of 50 gpm, still maintains a capture zone larger than the zone of ground-water contamination.

In order to check the results obtained from the analysis described above, Theis analysis was also performed to predict the drawdown and delineate the capture zone resulting from pumping RW-1 at 50 gpm. Using the average values for transmissivity and storativity obtained from the pumping test analysis,

pumping Well RW-1 at a rate of 50 gpm would produce water-table slopes similar to those calculated from the "linear relationship/ratio" analysis applied to the observed drawdowns. The analysis predicted that the width of the capture zone would extend at least 100 feet, the distance from RW-1 to Piezometers 18 and 21.

REFERENCE

Lohman, S.W. 1979. Ground-Water Hydraulics. U.S. Geological Survey Professionsl Paper 708. pp.70.

Table A1. Volatile Organic Compounds in ug/L (ppb), Detected in Ground Water Samples Collected from Monitoring Wells and Piezometers, July to December 1988, Lenox China Facility and Block 457, Lot 1.01, Pomona, New Jersey.

Well	Date	Lab	1,1-Dichloroethane	Methylene Chloride	1,2-Dichloroethene	Trichloroethene	Chloroform	1,1,1-Trichloroethane	Chlorobenzene
1	8/17/88	A	<1	1.9	<1	<1	<1	<1	<1
	11/16/88	Y	<5	<5	<10	<1	<5	<5	<5
3	8/17/88	A	<1	1.3	<1	<1	<1	<1	<1
	11/16/88	Y	<5	<5	<10	<1	<5	<5	<5
6	8/17/88	A	<1	1.2	<1	<1	<1	<1	<1
	11/16/88	Y	<5	<5	<10	<1	<5	<5	<5
9	8/17/88	A	<1	1.8	<1	<1	<1	<1	<1
	11/16/88	Y	<5	<5	<10	<1	<5	<5	<5
10	7/5/88	E	<20	180	120	1,400	<20	<20	<20
	8/17/88	A	<50	<50	75	880	<50	<50	<50
	11/16/88	Y	<5	<5	83	560	<5	<5	<5
11	7/5/88	E	<2	5.1	2.3	100	<2	<2	<2
	9/22/88	E	<1	<5	1.0	44	<1	<1	<5
	11/17/88	E	<1	5.5	<1	49	<1	<1	<5
12S	7/5/88	E	<2	5.2	<2	<2	5.2	<2	<2
	11/17/88	E	<1	13	<1	2.0	5.2	<1	<5
12D	7/5/88	E	<2	<5	<2	<2	<2	<2	<2
	7/5/88	E	<2	6.8	<2	<2	<2	<2	<2
	11/17/88	E	<1	9.7	<1	<2	2.3	<1	<5
13	7/5/88	E	<2	<5	<2	<2	14	<2	<2
	11/16/88	E	<1	<5	<1	19	15	<1	<5
14S	7/5/88	E	<20	59	<20	500	<20	<20	<20
	7/5/88	E	<20	<50	<20	880	<20	<20	<20
	11/16/88	E	<10	<50	<10	400	<10	<10	<50
14D	7/5/88	E	<2	8.6	<2	<2	<2	<2	<2
	11/16/88	E	<1	<10	<1	2.0	<1	<1	<5
15	7/5/88	E	<2	5.0	8.0	<2	<2	<2	<2
	11/16/88	E	<1	21	19	68	<1	1.7	<5
16	9/22/88	E	<1	<5	<1	87	<1	<1	<5
	11/17/88	E	<1	6.5	<1	78	1.4	<1	<5
17	9/22/88	E	<1	<5	3.8	110	<1	<1	<5
	11/17/88	E	<1	12	<1	58	<1	<1	<5

A AnalytiKEM Inc., Cherry Hill, New Jersey.
E Erco Laboratory, Cambridge, Massachusetts.
Y York Laboratories, Monroe, Connecticut.

Table A1. Volatile Organic Compounds in ug/L (ppb), Detected in Ground Water Samples Collected from Monitoring Wells and Piezometers, July to November 1988, Lenox China Facility and Block 457, Lot 1.01, Pomona, New Jersey.

Well	Date	Lab	1,1-Dichloroethane	Methylene Chloride	trans-1,2-Dichloroethene	Trichloroethene	Chloroform	1,1,1-Trichloroethane	Chlorobenzene
18	9/23/88	E	<1	<5	<1	27	<1	<1	<5
	11/17/88	E	<1	<5	1.7	31	<1	<1	<5
19	9/23/88	E	1.2	<5	28	6,800	<1	4.2	<5
	11/17/88	E	<100	<1,000	<100	7,700	<100	<100	<500
	11/17/88	E	<100	<1,000	<100	6,300	<100	<100	<500
20	9/23/88	E	<1	<5	1.1	2,200	<1	1.0	<5
	11/17/88	E	<1	6.2	2.6	2,100	<1	<1	<5
21	9/23/88	E	<1	<5	<1	1.1	<1	<1	<5
	11/17/88	E	<1	<10	<1	<1	<1	<1	<5
22	9/23/88	E	2.0	10	6.6	2,300	<1	<1	1.5
	11/17/88	E	<1	<5	2.9	2,000	<1	1.0	<5
23	11/17/88	E	<1	8.3	4.2	240	1.1	<1	<5
	11/17/88	E	<1	<5	3.2	210	<1	<1	<5
24	11/17/88	E	<1	<10	<1	<1	12	<1	<5
25	11/17/88	E	<1	<10	<1	3.0	<1	<1	<5
RW-1 (9:00)	12/6/88	E	<5	<25	<5	800	<5	<5	<5
(24:15)	12/7/88	E	<1	<10	<1	1,200	<1	1.1	1.7
(12:30)	12/7/88	E	<50	<250	<50	1,100	<50	<50	<250
(24:05)	12/8/88	E	<10	<50	<10	820	<10	<10	<50
(6:10)	12/8/88	E	<1	<10	5.5	910	<1	<1	<5
Trip Blank	7/5/88	E	<2	6.6	<2	<2	<2	<2	<2
	8/17/88	A	<1	1.2	<1	<1	<1	<1	<1
	9/23/88	E	<1	<5	<1	<1	<1	<1	<5
	11/16/88	Y	<5	<5	<10	<1	<5	<5	<5
	11/17/88	E	<1	12	<1	<1	<1	<1	<5
Field Blank	7/5/88	E	<2	<2	<5	<2	<2	<2	<2
	8/17/88	A	<1	1.8	<1	2.4	<1	<1	<1

A AnalytiKEM Inc., Cherry Hill, New Jersey.
E Erco Laboratory, Cambridge, Massachusetts.
Y York Laboratories, Monroe, Connecticut.

Table A2. Water-Level Data Prior to and During Pumping RW-1 at 122 GPM from December 6 to 8, 1988, Lenox China, Pomona, New Jersey.

Well	Elevation of Measuring Point (ft above mean sea level)	Static Water Level ------December 6, 1988------ Depth to Water Below Measuring Point (ft)	Static Water Level ------December 6, 1988------ Elevation of Water Level (ft above mean sea level)	Water Level After Pumping RW-1 24 Hours ------December 7, 1988------ Depth to Water Below Measuring Point (ft)	Water Level After Pumping RW-1 24 Hours ------December 7, 1988------ Elevation of Water Level (ft above mean sea level)	Drawdown (ft)	Water Level After Pumping RW-1 42 Hours ------December 8, 1988------ Depth to Water Below Measuring Point (ft)	Water Level After Pumping RW-1 42 Hours ------December 8, 1988------ Elevation of Water Level (ft above mean sea level)	Drawdown (ft)
1	69.28	14.03	55.25	14.20	55.08	0.17	14.23	55.05	0.20
3	67.09	12.31	54.78	12.33	54.76	0.02	12.35	54.74	0.04
4	66.96	7.26	59.70	7.47	59.49	0.21	7.74	59.22	0.48
5	64.17	9.48	54.69	9.53	54.64	0.05	9.59	54.58	0.11
6	65.08	9.78	55.30	10.10	54.98	0.32	10.27	54.81	0.49
7	67.31	10.57	56.74	10.72	56.59	0.15	10.83	56.48	0.26
8	67.16	10.23	56.93	10.25	56.91	0.02	10.25	56.91	0.02
9	69.51	14.30	55.21	14.58	54.93	0.25	14.59	54.92	0.29
10	63.51	8.30	55.21	8.84	54.67	0.54	8.94	54.57	0.64
11	63.24	8.11	55.13	8.40	54.84	0.29	8.49	54.75	0.38
12-S	62.62	7.27	55.35	7.49	55.13	0.22	7.55	55.07	0.28
12-D	62.89	7.74	55.15	7.95	54.94	0.21	7.98	54.91	0.24
13	64.66	9.30	55.36	9.65	55.01	0.35	9.75	54.91	0.45
14-S	63.64	8.36	55.28	9.28	54.36	0.92	9.38	54.26	1.02
14-D	63.63	8.57	55.06	9.04	54.59	0.47	9.09	54.54	0.52
15	66.07	10.94	55.13	11.08	54.99	0.14	11.14	54.93	0.20
16	62.34	7.14	55.20	7.39	54.95	0.25	7.45	54.89	0.31
17	62.33	7.19	55.14	7.46	54.87	0.27	7.53	54.80	0.34
18	63.77	8.50	55.27	9.37	54.40	0.87	9.61	54.16	1.11
19	64.04	8.80	55.24	10.16	53.88	1.36	10.25	53.79	1.45
20	64.43	9.12	55.31	10.76	53.67	1.64	11.13	53.30	2.01
21	64.24	8.89	55.35	9.83	54.41	0.94	9.94	54.30	1.05
22	63.30	8.04	55.26	8.66	54.64	0.62	8.72	54.58	0.68
23	61.44	6.34	55.10	6.51	54.93	0.17	6.59	54.85	0.25
24	62.79	7.63	55.16	7.82	54.97	0.19	7.89	54.90	0.26
25	61.32	6.30	55.02	6.44	54.88	0.14	6.51	54.81	0.21
RW-1	64 *	9.02	55	14.86	49	5.84	15.49	49	6.47

* Well RW-1 has not yet been surveyed. Elevation is approximate.

Table A3. Drawdown During December 6-8, 1988 Aquifer Test, Lenox China, Pomona, New Jersey.

Elapsed Time (minutes)	Pumping Well RW-1 (feet)	Piezometer 18 (feet)	Piezometer 19 (feet)	Piezometer 20 (feet)
0.00	0.00	0.00	0.00	0.00
0.02	0.94	0.00	0.02	0.02
0.03	2.12	0.00	0.03	0.02
0.05	3.35	0.00	0.04	0.04
0.07	4.29	0.01	0.07	0.08
0.08	4.82	0.01	0.10	0.12
0.10	5.09	0.02	0.15	0.17
0.12	5.21	0.02	0.19	0.23
0.13	5.25	0.03	0.23	0.28
0.15	5.32	0.04	0.26	0.33
0.17	5.36	0.06	0.29	0.36
0.18	5.44	0.07	0.32	0.40
0.20	5.46	0.08	0.34	0.42
0.22	5.53	0.09	0.36	0.45
0.23	5.53	0.10	0.38	0.47
0.25	5.56	0.11	0.40	0.49
0.27	5.58	0.11	0.41	0.51
0.28	5.63	0.12	0.43	0.52
0.30	5.69	0.13	0.44	0.54
0.32	5.68	0.14	0.45	0.56
0.33	5.70	0.15	0.46	0.57
0.35	5.66	0.15	0.48	0.58
0.37	5.69	0.16	0.48	0.59
0.38	5.69	0.17	0.50	0.60
0.40	5.69	0.17	0.50	0.61
0.65	5.88	0.24	0.60	0.73
0.90	5.84	0.29	0.66	0.79
1.15	5.83	0.32	0.69	0.82
1.65	5.85	0.37	0.74	0.88
2.15	5.83	0.40	0.78	0.92
2.65	5.78	0.43	0.80	0.94
3.15	5.75	0.45	0.82	0.96
3.65	5.80	0.47	0.84	0.98
4.15	5.79	0.48	0.85	0.99
4.65	5.77	0.49	0.86	1.01
5.15	5.81	0.50	0.87	1.02
6.15	6.05	0.52	0.90	1.06
7.15	5.83	0.53	0.91	1.06
8.15	5.90	0.54	0.92	1.07
9.15	6.01	0.56	0.95	1.10
10	5.99	0.58	0.96	1.11
12	6.01	0.59	0.98	1.13
14	6.04	0.60	0.99	1.15

Table A3. Drawdown During December 6-8, 1988 Aquifer Test, Lenox China, Pomona, New Jersey.

Elapsed Time (minutes)	Pumping Well RW-1 (feet)	Piezometer 18 (feet)	Piezometer 19 (feet)	Piezometer 20 (feet)
16	6.04	0.61	1.00	1.15
18	6.02	0.62	1.01	1.16
20	6.07	0.63	1.02	1.17
22	6.07	0.64	1.03	1.18
24	6.00	0.64	1.03	1.19
26	6.09	0.64	1.04	1.20
28	6.09	0.65	1.05	1.20
30	6.07	0.65	1.05	1.20
35	6.10	0.66	1.06	1.22
40	6.09	0.67	1.07	1.23
45	6.10	0.68	1.08	1.24
50	6.10	0.69	1.09	1.25
55	6.11	0.69	1.09	1.26
60	6.11	0.70	1.10	1.26
70	6.10	0.70	1.10	1.27
80	6.12	0.71	1.12	1.29
90	6.09	0.72	1.13	1.30
100	6.09	0.72	1.14	1.31
110	6.08	0.73	1.14	1.32
120	6.10	0.73	1.16	1.33
140	6.10	0.74	1.17	1.35
160	6.09	0.75	1.18	1.36
180	6.11	0.76	1.20	1.38
200	6.11	0.76	1.21	1.39
220	6.12	0.77	1.22	1.41
240	6.15	0.78	1.23	1.43
260	6.17	0.78	1.24	1.44
280	6.17	0.78	1.25	1.45
300	6.20	0.79	1.26	1.47
320	6.21	0.79	1.27	1.47
340	6.20	0.80	1.28	1.48
360	6.22	0.80	1.28	1.49
380	6.20	0.81	1.29	1.50
400	6.20	0.81	1.30	1.51
420	6.22	0.82	1.30	1.52
440	6.22	0.82	1.31	1.53
460	6.21	0.83	1.31	1.54
480	6.23	0.83	1.32	1.55
500	6.23	0.83	1.32	1.56
520	6.23	0.84	1.33	1.56

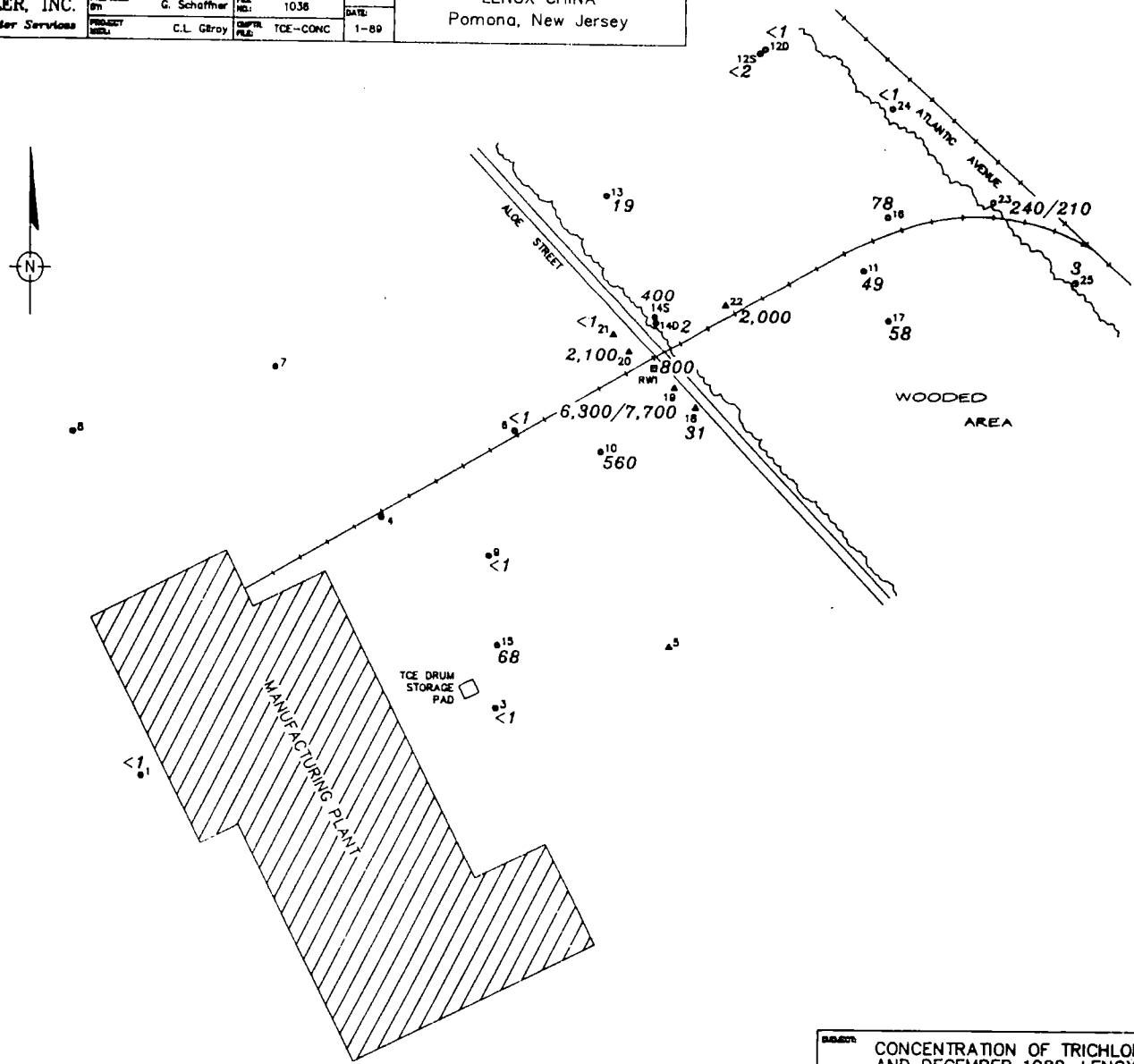
Table A3. Drawdown During December 6-8, 1988 Aquifer Test, Lenox China, Pomona, New Jersey.

Elapsed Time (minutes)	Pumping Well RW-1 (feet)	Piezometer 18 (feet)	Piezometer 19 (feet)	Piezometer 20 (feet)
540	6.23	0.84	1.33	1.57
560	6.26	0.84	1.33	1.58
580	6.24	0.85	1.34	1.59
600	6.25	0.85	1.34	1.59
620	6.24	0.86	1.35	1.60
640	6.26	0.86	1.35	1.60
660	6.25	0.86	1.35	1.61
680	6.23	0.86	1.35	1.62
700	6.26	0.87	1.36	1.63
720	6.24	0.87	1.36	1.64
740	6.26	0.87	1.36	1.64
760	6.25	0.87	1.37	1.65
780	6.25	0.88	1.37	1.65
800	6.28	0.88	1.37	1.66
820	6.27	0.88	1.37	1.67
840	6.26	0.88	1.37	1.67
860	6.28	0.88	1.37	1.67
880	6.27	0.88	1.37	1.68
900	6.25	0.88	1.37	1.68
920	6.25	0.89	1.38	1.68
940	6.28	0.89	1.38	1.69
960	6.27	0.89	1.38	1.69
980	6.27	0.90	1.38	1.70
1000	6.28	0.90	1.39	1.71
1100	6.27	0.92	1.40	1.74
1200	6.28	0.94	1.41	1.76
1300	6.34	0.97	1.42	1.80
1400	6.34	0.98	1.42	1.83
1500	6.34	1.00	1.42	1.85
1600	6.41	1.02	1.43	1.88
1700	6.39	1.04	1.43	1.90
1800	6.37	1.04	1.43	1.92
1900	6.42	1.05	1.44	1.94
2000	6.41	1.05	1.42	1.94
2100	6.47	1.07	1.42	1.96
2200	6.42	1.08	1.43	1.97
2300	6.45	1.09	1.44	1.98
2400	6.44	1.09	1.44	1.99
2500	6.46	1.10	1.45	2.00
2545	6.46	1.11	1.45	2.01

GERAGHTY & MILLER, INC.
Ground-Water Services

COMPILED BY:	C.L. Gilroy	PROJECT NO.:	NY0627TC01	SCALE:	shown
PREPARED BY:	G. Schaffner	FILE NO.:	1038	DATE:	1-89
PROJECT MGR.:	C.L. Gilroy	CHRTR. FILE:	TCE-CONC		

PREPARED FOR: LENOX CHINA
Pomona, New Jersey



EXPLANATION

- ●17 — LOCATION AND DESIGNATION OF MONITORING WELL
- ▲22 — LOCATION AND DESIGNATION OF PIEZOMETER
- ⊡ RW1 — LOCATION AND DESIGNATION OF RECOVERY WELL
- 58 — CONCENTRATION OF TRICHLOROETHENE IN µg/l (ppb); TWO VALUES INDICATE BLIND FIELD REPLICATES
- NOTE: REFER TO ACCOMPANYING DATA TABLE FOR SAMPLING DATES AND LABORATORIES

SUBJECT: CONCENTRATION OF TRICHLOROETHENE IN MONITORING WELLS, NOVEMBER AND DECEMBER 1988, LENOX CHINA FACILITY AND ADJACENT BLOCK 457, LOT 1.01, POMONA, NEW JERSEY

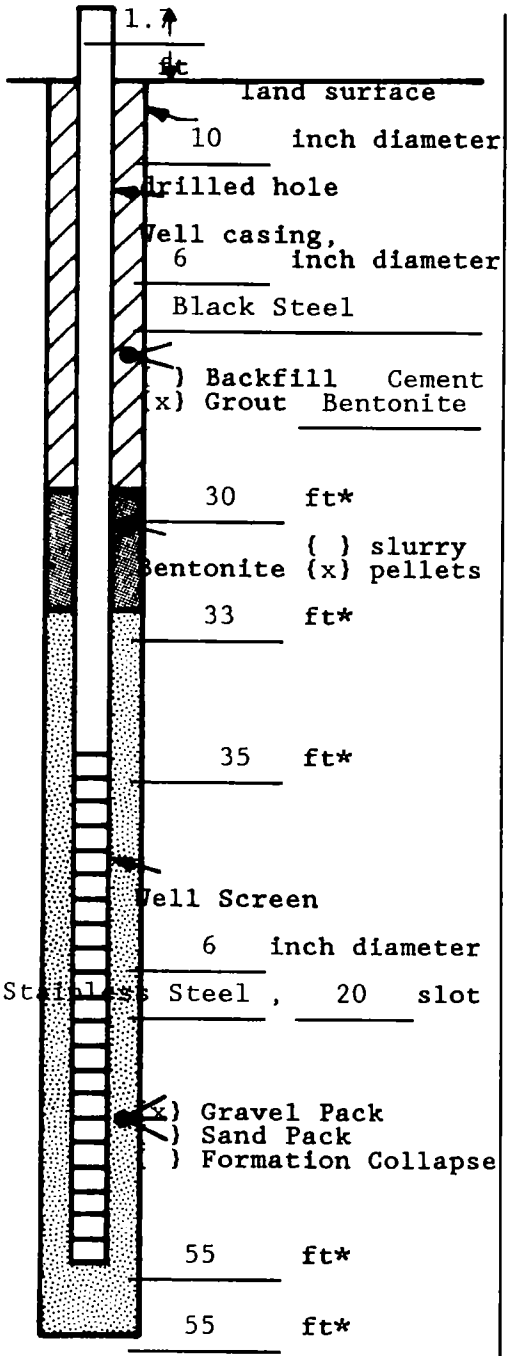
FIGURE A1

GERAGHTY & MILLER, INC.

FIGURE A2

WELL CONSTRUCTION LOG

(UNCONSOLIDATED)



Measuring Point is Top of Well Casing Unless Otherwise Noted.

* Depth Below Land Surface

Project Lenox, China Well RW-1

Town/City Pomona

County Atlantic State New Jersey

Permit No. 36-10833

Land-Surface Elevation and Datum _____ feet ( ) Surveyed ( ) Estimated

Installation Date(s) 11/29/88

Drilling Method Mud Rotary

Drilling Contractor Absecon Electric Motor Works

Drilling Fluid Water

Development Technique(s) and Date(s)
Pumping, surging and jetting with compressed air.

Fluid Loss During Drilling 1200 gallons

Water Removed During Development 37500 gallons

Static Depth to Water 9.1 feet below M.P.

Pumping Depth to Water 11 feet below M.P.

Pumping Duration 12½ hours

Yield 50 gpm Date 12/1/88

Specific Capacity 25 gpm/ft

Well Purpose Recovery

Fracture Zones _____

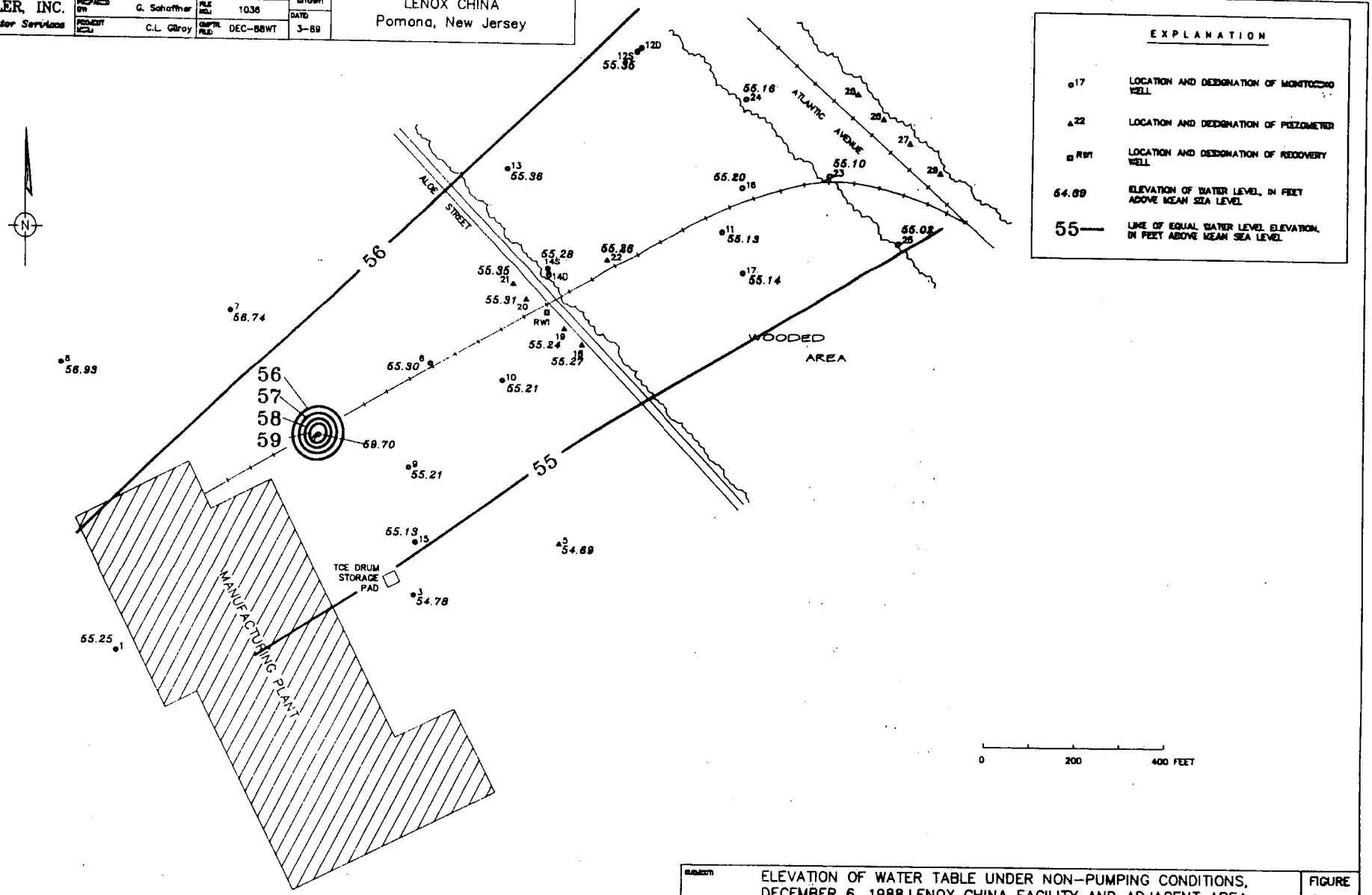
Remarks _____

Prepared by C. Schmidt, C. Gilroy

GERAGHTY & MILLER, INC.
Ground-Water Services

COMPILED BY	C.L. Gilroy	PROJECT NO.	NY0627TC01	SCALE	shown
PREPARED BY	G. Schaffner	FILE NO.	1036	DATE	3-89
PROJECT MGR.	C.L. Gilroy	CHRTR. FILE	DEC-88WT	PREPARED FOR	

LENOX CHINA
Pomona, New Jersey



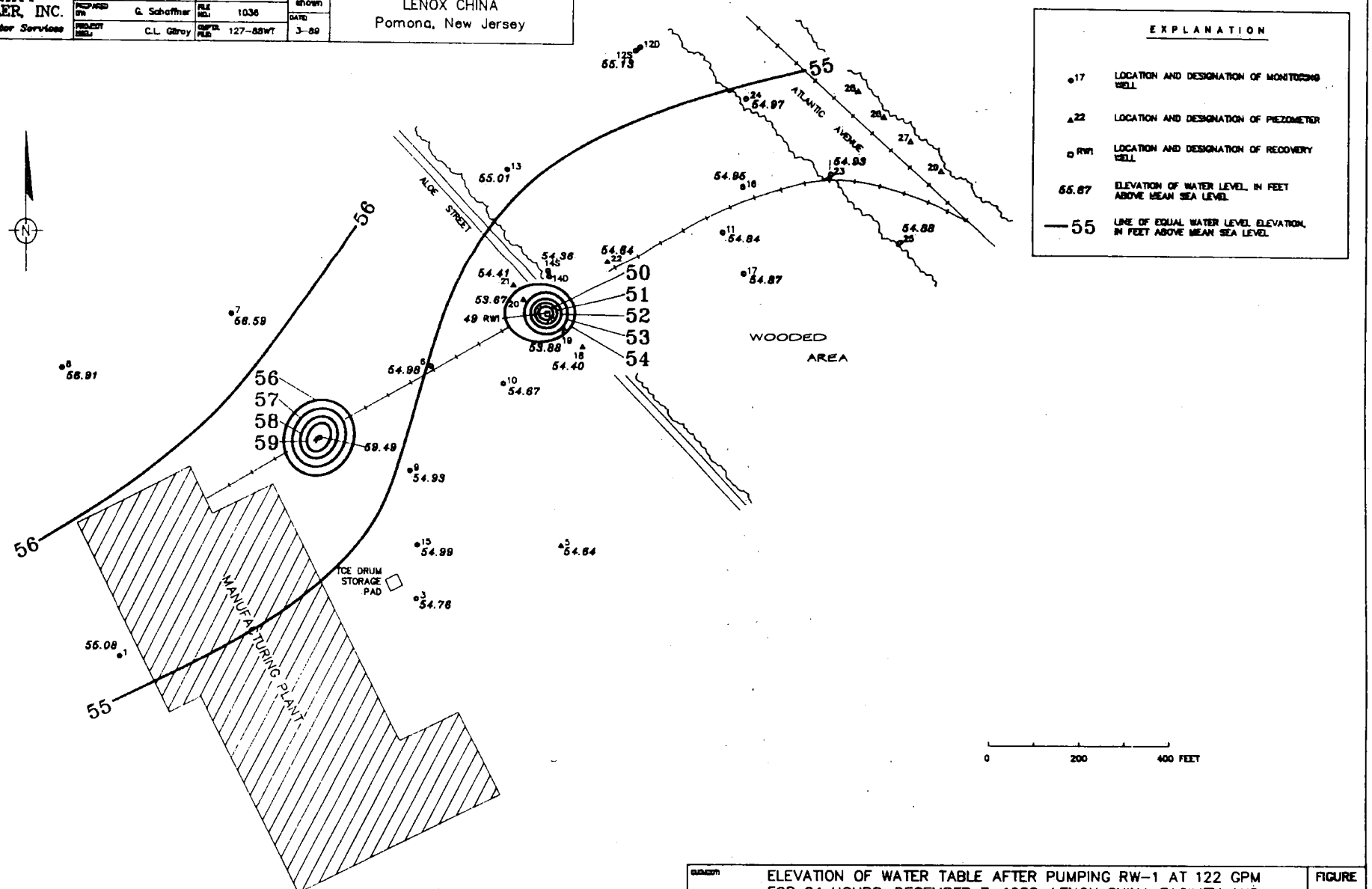
ELEVATION OF WATER TABLE UNDER NON-PUMPING CONDITIONS, DECEMBER 6, 1988, LENOX CHINA FACILITY AND ADJACENT AREA, POMONA, NEW JERSEY

FIGURE A3

GERAGHTY & MILLER, INC.
Ground-Water Services

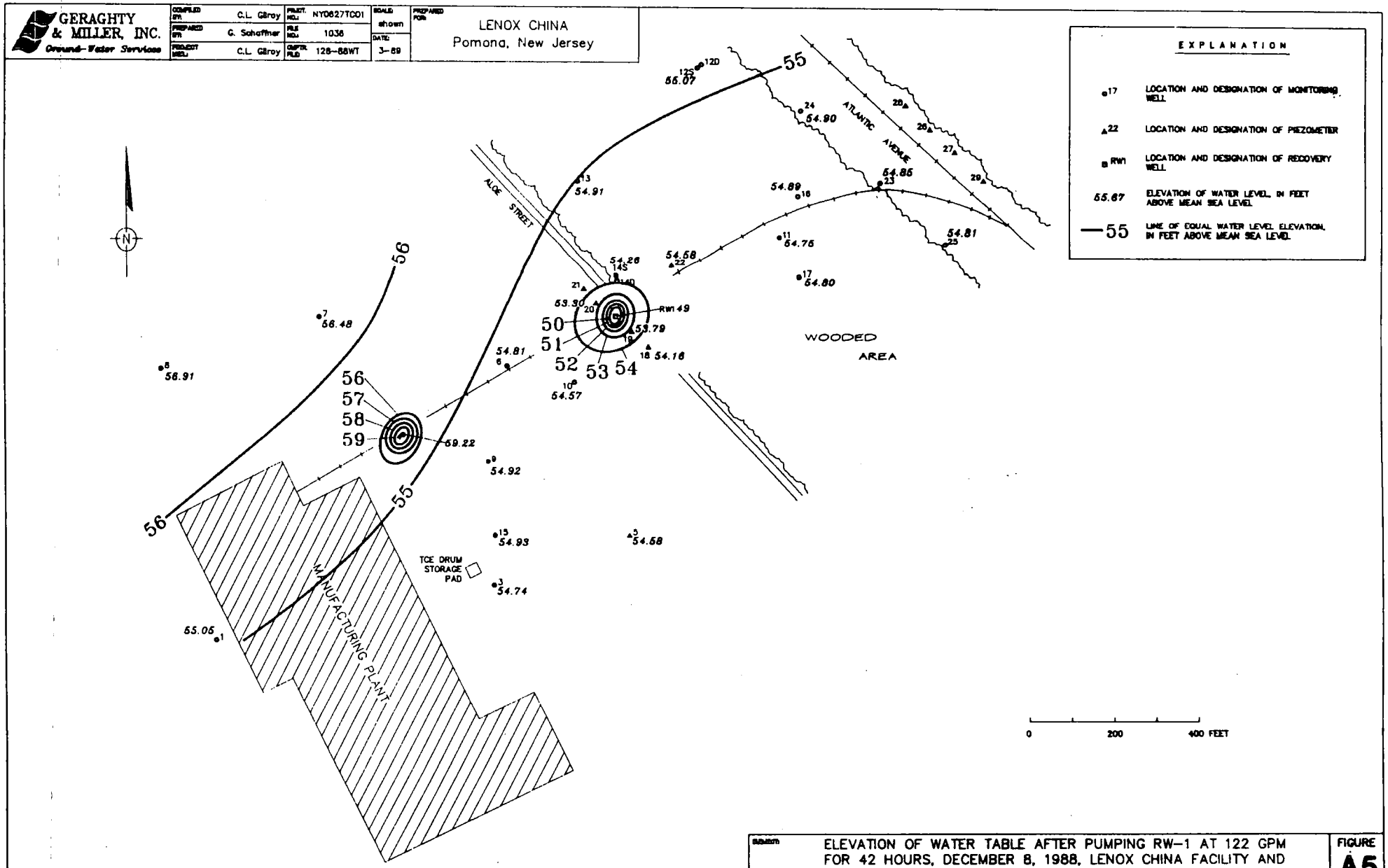
COMPILED BY	C.L. Gilroy	PROJECT NO.	NY0827TC01	SCALE	shown
PREPARED BY	G. Schaffner	FILE NO.	1036	DATE	3-89
PROJECT MGR.	C.L. Gilroy	CHRON. FILE	127-88WT	PREPARED FOR	

LENOX CHINA
Pomona, New Jersey



ELEVATION OF WATER TABLE AFTER PUMPING RW-1 AT 122 GPM FOR 24 HOURS, DECEMBER 7, 1988, LENOX CHINA FACILITY AND ADJACENT AREA, POMONA, NEW JERSEY

FIGURE A4

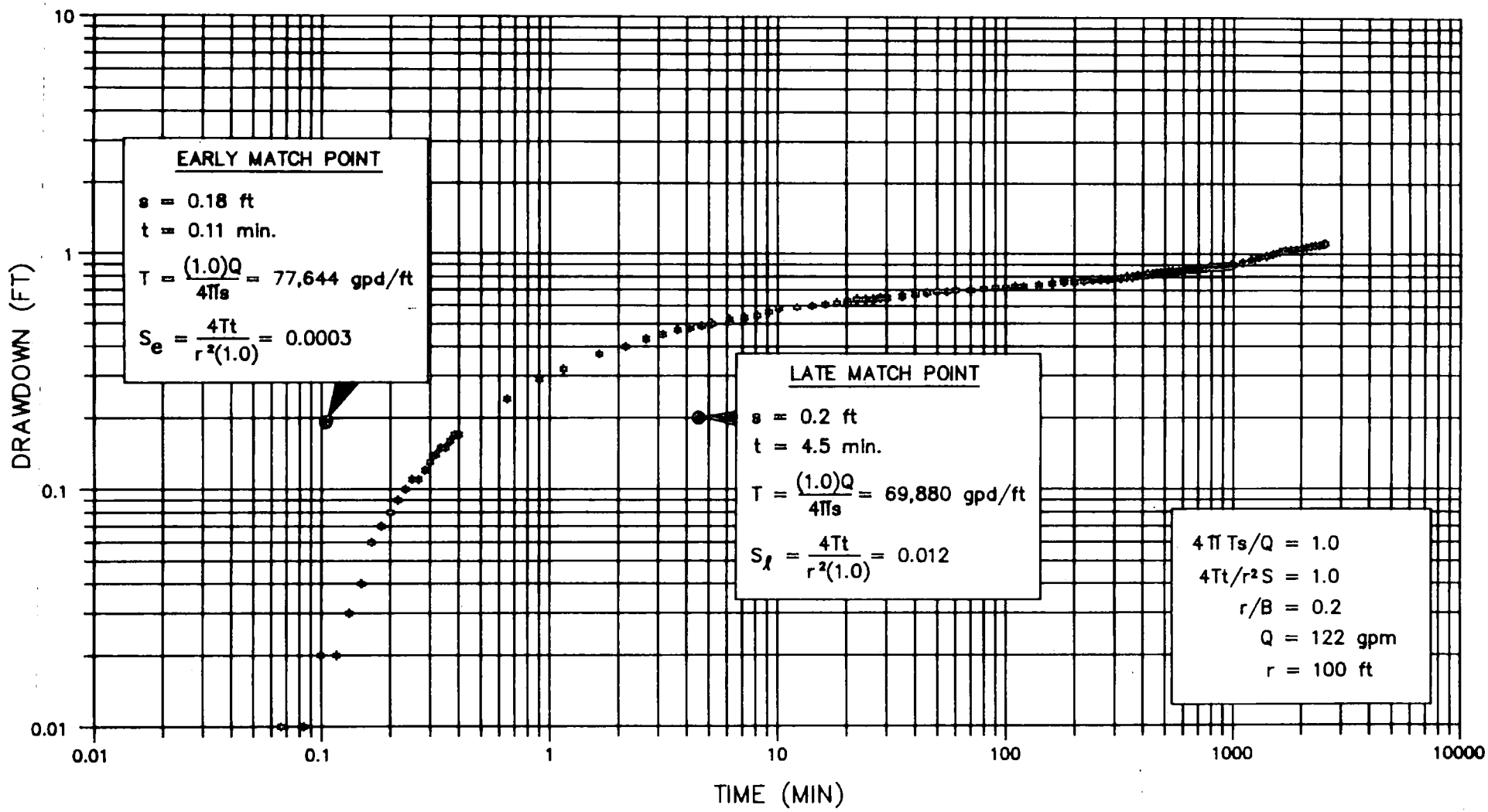


ELEVATION OF WATER TABLE AFTER PUMPING RW-1 AT 122 GPM FOR 42 HOURS, DECEMBER 8, 1988, LENOX CHINA FACILITY AND ADJACENT AREA, POMONA, NEW JERSEY

FIGURE A5

GERAGHTY & MILLER, INC.
Ground-Water Services

COMPILED BY	B. A. Blum	PROJECT NO.	NY0627TC01	SCALE	shown
PREPARED BY	W.H. Cicio	FILE NO.	1036	DATE	3-89
PROJECT MGR.	C. Gilroy	CHRON. FILE	PIEZ-18	PREPARED FOR	LENOX CHINA Pomona, New Jersey

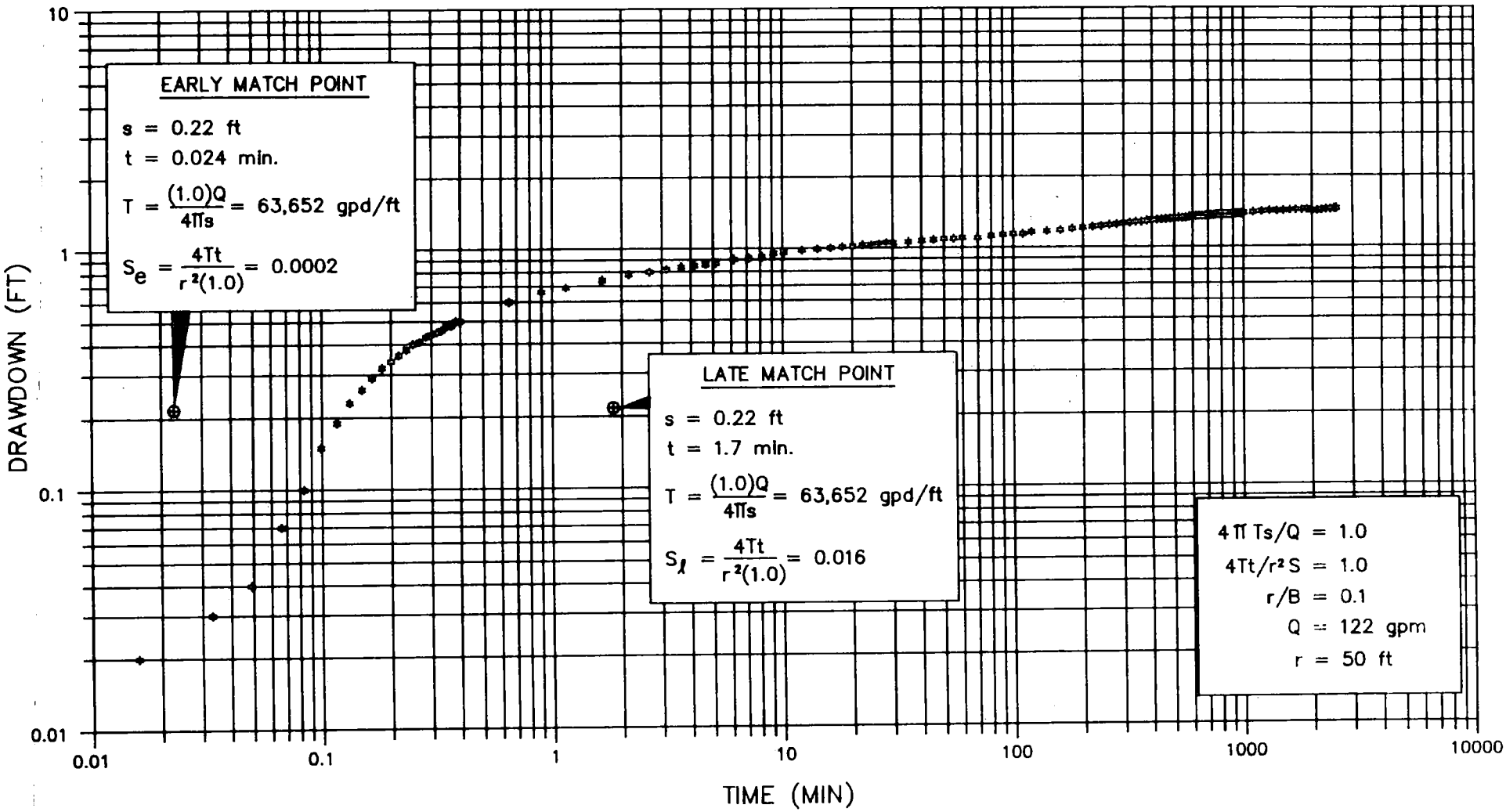


SUBJECT: LOGARITHMIC PLOT OF TIME VERSUS DRAWDOWN FOR PIEZOMETER 18 WHILE PUMPING RW-1, DECEMBER 6-8, 1988

FIGURE **A6**

GERAGHTY & MILLER, INC.
Ground-Water Services

COMPILED BY:	B.A. Blum	PROJECT NO.:	NY0627TC01	SCALE:	shown
PREPARED BY:	W.H. Ciclo	FILE NO.:	1036	DATE:	3-89
PROJECT MGR.:	C. Gilroy	CHPTR. FILE:	PIEZ-19	PREPARED FOR:	LENOX CHINA Pomona, New Jersey



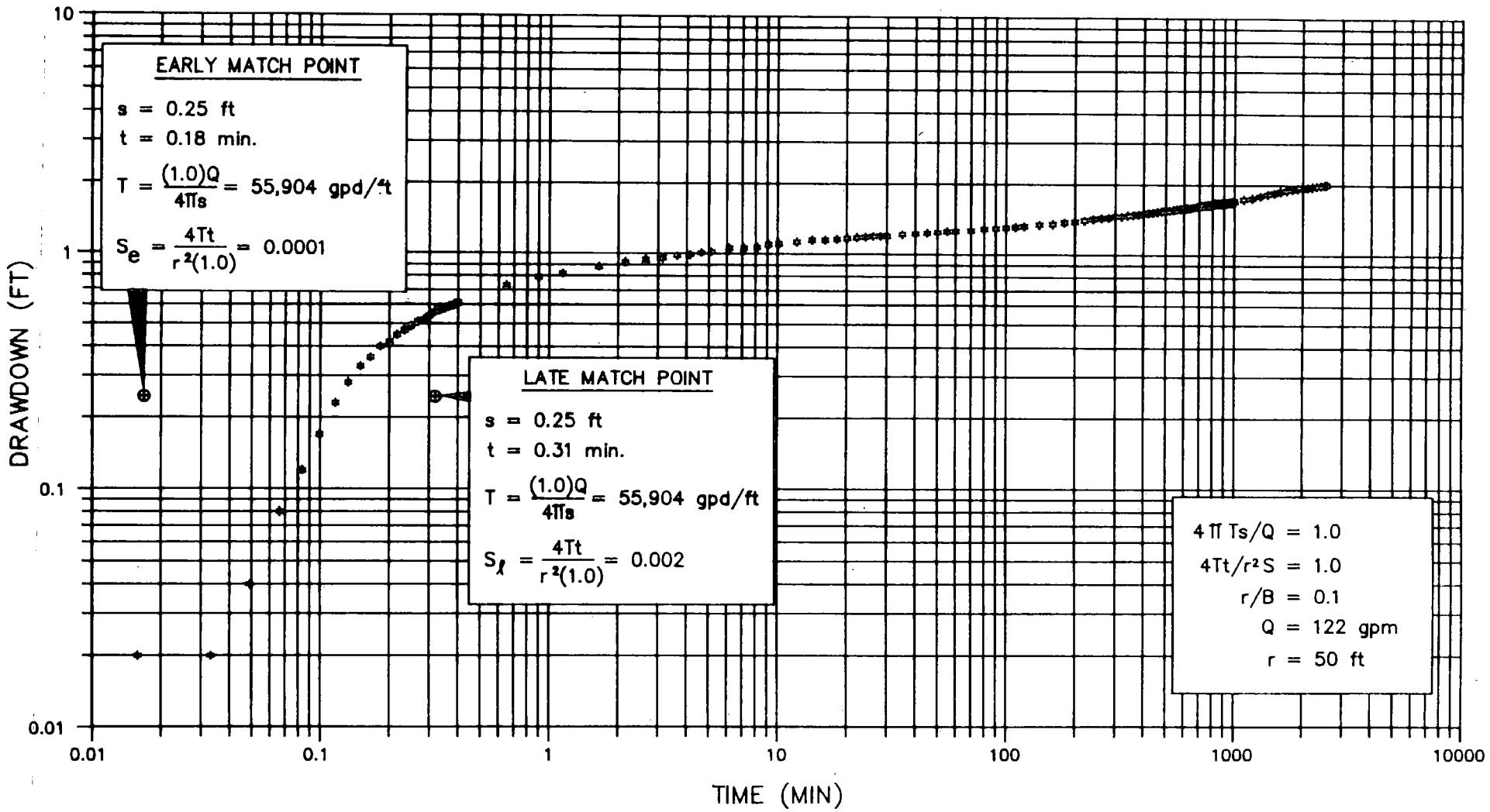
SUBJECT: LOGARITHMIC PLOT OF TIME VERSUS DRAWDOWN FOR PIEZOMETER 19 WHILE PUMPING RW-1, DECEMBER 6-8, 1888

FIGURE A7

GERAGHTY & MILLER, INC.
Ground-Water Services

COMPILED BY:	B.A. Blum	PROJECT NO.:	NY0627TC01	SCALE:	shown
PREPARED BY:	W.H. Cioio	FILE NO.:	1036	DATE:	3-89
PROJECT MGR.:	C. Gilroy	CHPTR. FILE:	PIEZ-20		

PREPARED FOR:
LENOX CHINA
Pomona, New Jersey

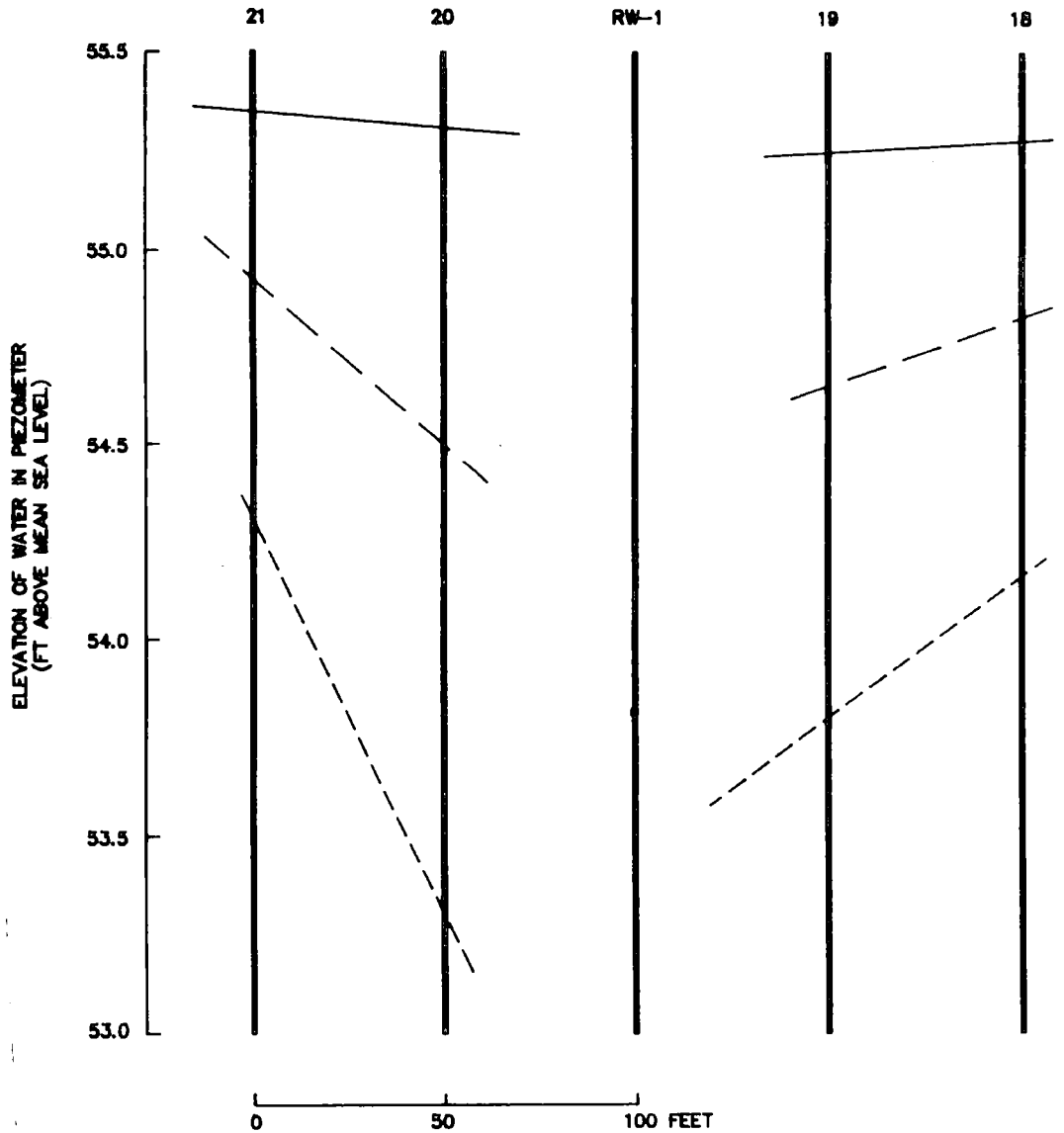


SUBJECT: LOGARITHMIC PLOT OF TIME VERSUS DRAWDOWN FOR PIEZOMETER 20 WHILE PUMPING RW-1, DECEMBER 6-8, 1988

FIGURE
A8

GERAGHTY & MILLER, INC.
Ground-Water Services

COMPILED BY:	B. Blum	PROJECT NO.:	NY627TC01	SCALE:	shown
PREPARED BY:	W.H. Cicio	FILE NO.:	1036	DATE:	3-89
PROJECT MGR.:	C. Gilroy	CHAPTER FILE:	WL-XSEC	PREPARED FOR:	LENOX CHINA Pomona, New Jersey



(1) STATIC CONDITIONS, DECEMBER 6, 1988
(Water-Level Elevation in RW-1 = 55.3 Ft)

(3) THEORETICAL DRAWDOWN WHILE PUMPING RW-1 AT 50 GPM
(Water-Level Elevation in RW-1 = 52.6 Ft)

(2) AFTER PUMPING RW-1 AT 122 GPM FOR 42 HRS, DECEMBER 8, 1988
(Water-Level Elevation in RW-1 = 48.8 Ft)

SUBJECT:
CROSS-SECTIONAL VIEW OF WATER-LEVEL ELEVATIONS IN THE VICINITY OF RW-1 DURING NON-PUMPING, PUMPING, AND THEORETICAL PUMPING CONDITIONS

FIGURE
A9

APPENDIX C

Mounding Analysis, Disposal of Recovered Ground Water
Lenox China Facility, Pomona, New Jersey

MOUNDING ANALYSIS
DISPOSAL OF RECOVERED GROUND WATER
LENOX CHINA FACILITY
POMONA, NEW JERSEY

JUNE 1990

INTRODUCTION

Geraghty & Miller, Inc. has performed an analysis to determine the feasibility of infiltrating or injecting ground water generated from the trichloroethene (TCE) plume abatement system. Based on the current design of the system, it is anticipated that 400 gallons per minute (gpm) will be produced. The evaluation focussed on three basic scenarios:

1. Infiltration of the water through dry wells or infiltration galleries;

2. Injection of the water into the shallow part of the aquifer above 70 ft where a clay layer has been encountered at several locations; and

3. Injection of the water into the deeper part of the aquifer below the 70 ft.

PHYSICAL SETTING

The TCE contamination has been found in the saturated zone above a 2 to 3 ft-thick clay that appears to extend over most of the area of the plumes. On the Lenox property, the water table ranges in depth from approximately 4 to 10 ft below land surface. The aquifer zones above and below the clay yield good quantities of water. A transmissivity of 63,000 gallons per day/ft for the shallower zone was calculated from an aquifer test performed during December 6 to 8, 1988 using Recovery Well RW-1 (Figure 1).

The Lenox plant property is 53 acres, of which no more than a half of the area would be available for infiltration. Constraints on the areas of infiltration include the buildings and parking lots, and the areas around the waste-management facilities.

Infiltration in the waste areas would disrupt the ground-water monitoring systems that are in place.

OPTIONS FOR DISPOSAL TO GROUND WATER

Dry Wells or Infiltration Galleries

The Hantush analytical model was used to calculate the height of a mound which would form on the water table artificially recharged from a rectangular leach field. In this case, 400 gpm was applied uniformly over 24 acres and the clay layer is assumed to be impermeable. After 180 days, a mound of 5.4 ft above the ambient water-table surface developed and was continuing to build. Because the water-table surface comes to within 4 ft of land surface, such mounding, especially over such a wide area would not be acceptable. Through this analysis, Geraghty & Miller concludes that infiltration through a leach field is not feasible.

Injection into the Shallow Zone

The Theis solution was used to calculate the height of the mound which would form on the water-table aquifer artificially recharged from injection well(s). Two analytical runs were performed for the scenario of injecting the recovered water through wells from the water table down to just above the 70 ft clay:

1. All 400 gpm is injected using one well, and

2. 100 gpm is injected into each of four wells.

Injecting 400 gpm at one location results in a mound of over 18 ft at the injection well and a mound of 6 ft over the entire Lenox property (Figure 2). Because the water-table can come within 4 ft of land surface, this amount of mounding is unacceptable. Based on this analysis, Geraghty & Miller concludes that injecting 400 gpm with one well into the

shallower zone is not feasible.

Injecting at four locations at 100 gpm each helps to reduce the height of the mound at each injection location. After 10 years, a mound of 4.5 ft develops at each well (Figure 3). However, the mounding effects are additive, and the four wells would interfere with each other as shown in Figure 3: 1.5 ft of mounding results at a distance of 1,500 ft from each well. Assuming a spacing of 1,500 ft between wells, the total mound at each well would be approximately 6 ft. This mound would be in excess of the thickness of the unsaturated zone in many areas of the Lenox property.

Injection into the Aquifer Below 70 ft.

The deeper part of the aquifer potentially has a much greater capacity to receive water because its estimated thickness, based on logs of Lenox's production wells, is greater than that for the shallow part of the aquifer above the clay at 70 ft. If the clay proves to be present in the area selected for injection, the placement of water below the clay will have little effect on the water levels in the part of the aquifer above the clay. If the clay is not consistently present or is leaky, then the injection-well system can be designed to place water throughout more of the saturated thickness from 20 to 40 ft below the water table down to an appropriate depth (to be discussed below). The availability of a thick slab of aquifer (not just the portion above 70 ft) makes the disposal of water feasible without excess mounding at the surface.

Although enhanced aquifer flushing and shortened cleanup times usually result from placement of the injected water upgradient of the plume(s), such a location on the Lenox property is also upgradient of the monitoring system for the plant's waste management facilities. To avoid any potential impact on this system, Geraghty & Miller recommends that the injected water be placed in downgradient areas of the Lenox property.

DESIGN OF INJECTION SYSTEM

Geraghty & Miller recommends that the following steps be taken to design an injection system for the TCE plume project.

1. Determine the total amount of capacity the system must have. Through plume delineation and aquifer testing, 400 gpm is the amount of water to be generated. Because injection wells decline in efficiency through use, the injection system must accommodate more than 400 gpm. In addition, the highest water levels to date may not be the highest to be encountered during the remediation period, so the amount of acceptable mounding must be determined conservatively. Therefore, the injection system should be designed to accommodate 800 gpm. The system must be able to operate fully with at least one well shut down for servicing.

2. Determine the locations for the wells. As stated above, it would be prudent to locate the wells in downgradient area of the plant property. The spacing of the wells will be determined from the mounding analysis and the thickness of the unsaturated zone in the selected area.

3. Determine the depth of the wells. Based on the December 1988 aquifer test and the modeling analysis, the aquifer can accept 1 to 2 gpm per ft of sand and gravel. That is, a well screened in 100 ft of sand and gravel can receive 100 to 200 gpm continuously without excessive mounding. Drilling should begin at the first location and geologic samples should be taken to determine the suitability of the material to accept the injected water and the presence of substantial clay zones. A well can be installed when a third to a fifth of the needed capacity is reached. The same process will be repeated at additional well sites until the entire capacity is achieved. Based on currently available information about the aquifer, approximately 530 ft of screened zone will be needed. If this total is divided evenly among four wells, for example, each well would have 130 to 140 ft of screen.

CONCLUSIONS

The mounding analysis shows that addition of water to the uppermost 70 ft is not physically feasible, either by infiltration or by injection. Use of a greater cross section of the aquifer (portions both above and below 70 ft) provides sufficient capacity to receive the planned effluent from the proposed TCE plume remediation system. The drilling of pilot holes in conjunction with well installation will provide the geologic information required to determine the exact injection well design.

#NJ11716/082890.